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The Effects of an Enriched Environment on the Stereotypic Movement of Individuals With Profound Mental Retardation.

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THE EFFECTS OF AN ENRICHED ENVIRONMENT ON THE STEREOTYPIC MOVEMENT OF INDIVIDUALS WITH PROFOUND MENTAL RETARDATION

A Dissertation

Submitted to the graduate faculty of the
Louisiana State University and
Agriculture and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Psychology

by
Brandi B. Smiroldo
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Dedication

This work is dedicated to my three "guardian angels."

Kati Marie Braud, who teaches me everyday how precious life is and how much we have to learn from each person we encounter and who inspires me everyday to help those who are more in need;

Bernice Roussel Braud, who always loved me, faults and all, and by doing so taught me to be open to others who might be a little less than perfect;

and

Warren B. (Chookie) King, whose life was short, but whose wisdom will not be forgotten and included such sayings as "It ain't about you" when referring to life and its complexities. He taught me that we do not exist in this world alone, we have much to give to those around us, and if we give to others we may find that we gain much in return.

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certainly made pursuing my goals much easier. My parents, Dwight and Debbie Braud, have guided me throughout my life. They have been strong influences on my decisions, but have also taught me to think for myself and to go after my dreams. They made me believe that I could accomplish anything, if I just believed in myself and worked hard to do so. Thanks mom and dad for all you've given me. You are so much a part of who I am today. My husband, Chris Smiroldo, deserves to share this degree with me. He has never wavered in his love, support, and understanding during the five years it has taken me to get to this point. Additionally, he did the best he could to provide us with some semblance of "normality" at home so we could escape from the demands of work and school if only for brief moments. Chris, I will never be able to express how much all you've done has meant to me.

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Abstract

The present study was an attempt to investigate the effects of a specific type of enriched environment on the stereotypic movements of individuals with severe and profound mental retardation. A multisensory room which contained visual, auditory, and tactile stimulation was used. Effects of brief exposure to the multisensory room was compared to effects of exposure to a placebo probe involving attention and access to tangibles and to no treatment controls. Comparisons were made during a 10-minute post-test session immediately following. No significant differences between groups on rate of stereotypic movements at post-test was noted, anecdotal information and review of raw data suggest that there may have been a slight effect of exposure to the sensory room, however. Implications of the findings, along with possible factors influencing results and suggestions for future studies are discussed.

Introduction

Mental retardation is a disorder that effects approximately 3% of the population (Scheerenberger, 1987; McLaren & Bryson, 1987; Keily, 1987). These individuals evince multiple difficulties including deficits in adaptive behavior, lack of adequate social skills, physical handicaps, other mental disorders and a high prevalence of problematic behaviors (Durand, 1990; Hale & Borkowski, 1991; Marchetti & Campbell, 1990; Matson & Marchetti, 1988; Reid, Wilson, & Faw, 1991).

Numerous problematic behaviors including aggression, self-injury, property destruction, noncompliance, inappropriate sexual behavior, and stereotypic movements may be observed in individuals with mental retardation. Exhibition of such behaviors may interfere with the individual's ability to function within social settings and to perform basic activities of daily living (Durand, 1990; Schroeder, 1990). This interference with social and functional activities impedes the learning of new skills and the individual's integration into community life. Thus, investigations into the factors contributing to the emergence and maintenance of such behaviors and effective treatment is essential.

The focus of this proposal will be the treatment of one of the most prevalent behavioral difficulties in this population, stereotypic movements.

A review of the defining features of mental retardation along with an overview of stereotypic movement disorder is provided. Etiology, prevalence and treatment issues will be discussed.

Overview of Mental Retardation

History

Traditionally, the American Association on Mental Retardation (AAMR), formerly the American Association on Mental Deficiency (AAMD), has developed the most widely accepted definition of mental retardation. Although a diagnosis is currently based on test results, usually any referral is based on an observation by a parent, teacher, or professional that the child is functioning at a lower level than his/her same age peers (Cleland, 1978; Coker, 1989; Jensen, 1987; Scheerenberger, 1983). In fact, testing was not used until the twentieth century. The observation usually notes some delays in developmental milestones such as speech and motor areas. Sociocultural factors also come into play in observation of deficits.

The American Association on Mental Deficiency (AAMD) was formed in 1876. In 1910, the AAMD used the term feeble-minded to refer to individuals with developmental delays (Matson & Marchetti, 1988; Scheerenberger, 1983). The term was further divided into idiots (those individuals who would not progress beyond a 2 year old developmental level), imbeciles (those who would not progress beyond a 7 year old

developmental level), and morons (those whose developmental level would peak at 12 years old).

Doll, in his 1936 presidential address to the AAMD defined mental retardation as social inadequacy, decreased intellect, and developmental arrestment (Matson & Marchetti, 1988; Scheerenberger, 1983). In the 1950's subgroups of individuals with mental retardation were added to the prevailing definition (Matson & Marchetti, 1988). Educable individuals were those who could attain a second to fourth grade level of functioning, while trainable individuals were those who could learn self-care skills. In addition to these two groups there were those individuals who were totally dependent on others. Despite the change in labels and reference points, these divisions are similar to the 1910 divisions in the focus on developmental expectations for each group.

Additional modifications were made to the AAMR definition in 1961 by Heber. He defined mental retardation as significant subaverage intelligence (I.Q. below 85) occurring in the developmental period (before age 18) and associated with deficits in adaptive behavior (Heber, 1961). Five levels were specified based on IQ scores including borderline, mild, moderate, severe, and profound. Borderline intellectual functioning is defined by an IQ score between 85 and 70 (above the cutoff for a

diagnosis, but still indicative of some impairment or difficulty). Individuals in the mild range would score between 50/55 and 70, were considered "educable" (attain education level up to grade 6) and often went unidentified until school age. Approximately 80-85% of individuals diagnosed with mental retardation will fall in the mild range. Moderate deficits were denoted by IQ scores between 35/40 and 50/55, and 10-15% of individuals evincing impairments will fall within this range. These individuals are considered "trainable" as they could learn semiskilled or unskilled work tasks, but generally attained only a third or fourth grade education level. Intelligence test scores in the 20/25 to 35/40 range would be indicative of functioning in the severe range. Individuals scoring in this range (3-4%) were able to learn some basic and intermediate daily living skills, generally did not successfully master academic tasks and required supervision a majority of the time. Individual's obtaining IQ scores below 20/25 were considered profoundly impaired and account for 1-2% of individuals diagnosed with mental retardation. While these individuals could learn some basic caretaking tasks, constant supervision was often needed.

Heber's definition suggested that mental retardation was environmental and not organic because it "indicated" that IQ could be

raised. This view is in contrast to much of the literature on mental retardation. While environmental influences may affect intellectual functioning, there are numerous organic etiologies of mental retardation such as fragile X syndrome and Down syndrome (Coker, 1989). Additionally, researchers have consistently documented the stability of IQ after the age of 5 (McCall, Applebaum & Hogarty, 1973; Zigler, Balla & Hodapp, 1984). Grossman altered the Heber definition, in 1983. The adaptive behavior and developmental criteria remained the same, while the I.Q. cutoff was moved to 70 (Grossman, 1983).

The addition of adaptive behavior deficits came from the controversy and difficulties surrounding the sole use of I.Q. measures. However, it was not until the rulings in numerous court cases favoring the inclusion of a social competency emphasis (Larry p. vs. Riles, 1972; Mattie T. vs. Holliday, 1977) and the passage of the Education for All Handicapped Children Act of 1975 (PL 94-142) that states began using the additional criteria (Scheerenberger, 1983). PL 94-142 requires the use of nonbiased testing for evaluating deficits and required more efforts on the school system for ensuring the education of all eligible children. Prior to this usage, many children were being identified as mentally retarded due to low I.Q. scores, but had no trouble in any areas other

than school performance. Mercer (1988) termed these individual's "six-hour retardates," referring to the time they spent in school.

Current Controversy

The only agreed upon aspect of the definition of mental retardation is that onset must occur prior to age 18. To clarify the definition and address other political and social issues surrounding a diagnosis of mental retardation, AAMR has issued a new definition (Luckasson, Coulter, Polloway, Reiss, Schalock, Snell, Spitalnik, & Stark, 1992). The new definition was generated following approximately 10 years of educational and policy shifts (Luckasson et al, 1992) including a greater emphasis on community integration and "normalization" along with a de-emphasis on disability/deficits in functioning . These shifts tended to add confusion to an already murky situation.

The goal of the new definition was to redefine mental retardation and connect the definition to the larger societal and systemic changes seen during the 1980s. These changes evolved in large part around the normalization movement. This philosophy attempts to move the focus away from viewing mental retardation as an overall defect in the individual and toward a look at deficits in particular areas with an eye toward training and improvement in those areas.

This change in focus was intended to place more emphasis on the individual and his/her current abilities and needs. Additionally, an attempt was made to marry the definition with the current trend toward community placement and participation for individuals with mental retardation. The result of this change in focus was a deemphasis on the actual defining features of mental retardation.

References to specific legal mandates related to provision of services for individuals with mental retardation can be found throughout the new definition. Such references reflect the tendency of the organization to emphasize political rather than clinical or scientific information. Problems may arise due to the continuing change in the political arena.

A review of the definition derived by Luckasson and colleagues does much to address this political and societal shift, but loses grounding in professional objectivity and practice (MacMillan, Gresham & Siperstein, 1993). The following section provides a review of the new definition along with a discussion of some issues of concern surrounding its changes and omissions.

The Latest Definition of Mental Retardation

The changes in the new AAMR definition are as follows. The intelligence score cutoff is raised to 75 from a previous cutoff of 70. This change will result in an increase in the number of individuals labeled mentally retarded and likely increase the problem of minority overrepresentation (Reschly & Ward, 1991). The new definition also subdivides adaptive behavior into 10 categories and requires a deficit in at least two. There is empirical evidence for neither this division nor the contention that deficits in two areas of adaptive functioning is sufficient for a diagnosis.

Considerable controversy currently surrounds this new definition of mental retardation (MacMillan, et al, 1993). The resulting definition lacks empirical validation and acceptance by the American Psychological Association (APA) and the individual state governments, but does appear to be viewed as "politically correct" by many (MacMillan, et al., 1993) This situation is a departure from previous years where AAMR's listing of the necessary criteria for a diagnosis was the basis for all other definitions.

The previous nomenclature grouped individuals by levels of functioning, as individuals with different intelligence levels have different

levels of language, social and motor skills as well as differing prevalence rates of problematic behaviors (Whitman, Sciback, & Reid, 1983). These differences provide validation for the proposed groupings because it allows for generalizations about the individual to be made. The new nomenclature does away with these groupings, ignoring recent scientific developments and previous evidence that groupings are useful (MacMillan, et al, 1993; MacMillan, et al, 1995). Correct classification based on scientific evidence helps to delineate clearer and more homogenous groups of individuals, thus, impacting treatment issues. Without an adequate classification system, membership in any one group does not necessarily give the clinician useful information. Destruction of this classification system also has a deleterious effect on research in the area as studies conducted using different definitions are more difficult to compare. Additionally, confusion results when attempts are made to apply results from a research study using one definition (ie., old definition) to groups of individuals diagnosed using another definition (ie., new definition).

Other areas of concern have been voiced regarding the new definition (MacMillan, Gresham, & Siperstein, 1995). Psychologists in particular are concerned with the practicality of making an adequate,

reliable, and valid diagnosis given the expansion of adaptive behavior categories, increase in IQ score cutoff, and addition of support levels. Several specific concerns have been cited. First, in reference to the increased IQ cutoff score, the American Psychological Association has stated that the number of people diagnosed as mentally retarded will dramatically increase. This situation is especially true regarding minorities. There is a disproportionate representation of minorities in the mild range of mental retardation (Reschly & Ward, 1989). Persons in the severe/profound ranges are relatively proportionate to the general population. Second, the 10 areas of adaptive functioning were not empirically derived. Additionally, there are currently no standardized tests specifically designed to assess functioning in these areas. Therefore, deficits in these adaptive areas cannot be evaluated reliably. Finally, it has been noted that there are no normative measures to assess the support levels (MacMillan, et al., 1993).

The American Psychiatric Association (1994) has adopted portions of this definition for the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders, while retaining elements from the previous AAMR definition (Grossman, 1983). This compromise is likely an attempt by the organization to satisfy the opposing groups (AAMR and

psychological professionals who disagreed with AAMRs new approach). DSM-IV's definition involves the following criteria. First, the individual must have "significant subaverage intellectual functioning" as defined by an intelligence score of 70 or below. This intellectual functioning is usually measured by standardized intelligence tests such as the Stanford-Binet IV or the Wechsler Intelligence Scales. The individual must also have significant deficits in adaptive functioning. DSM-IV adopts the AAMR's 1992 divisions and specifications of adaptive behavior and assesses these deficits using adaptive behavior scales such as the American Association for Mental Deficiency's Adaptive Behavior Scale and the Vineland Adaptive Behavior Scale. These deficits, like the onset of mental retardation, must be present before age of 18. Individuals who meet criteria for a diagnosis of mental retardation are further classified by level of severity using the DSM-IV classification (APA, 1994). AAMR no longer uses severity levels (eg. Mild, Moderate, Severe, Profound, and Unspecified).

In addition to the definitions developed by AAMR and APA, different states may also adopt different criteria for a diagnosis. A consensus is necessary to avoid added confusion in diagnosing this disorder. The present study will utilize APA's definition because DSM-IV

is the accepted diagnostic system for psychological professionals in the United States and the current AAMR definition is fraught with problems as noted earlier in the proposal.

Etiology

Classification of individuals diagnosed as mentally retarded may tell the clinician something about the individual's level of functioning, but it does not provide insight into etiology. Identification of the cause of mental retardation is often difficult due to the frequent co-occurrence of potential etiological factors in the same individual. An interaction between several factors such as genetic disorders, medical complications, and environmental conditions may result in developmental delays (Deitz & Repp, 1989).

A discussion of etiology is important for the present study for several reasons. First, stereotypic movements are associated with certain etiological factors implicated in mental retardation (Guess & Carr, 1991; Lewis & Baumeister, 1982; Schroeder, 1991). Additionally, biological mechanisms have been implicated in the emergence and maintenance of stereotypic movement disorder as well as mental retardation. Thus, it may be that individuals diagnosed with mental retardation due to an identifiable biological factor will be more predisposed to exhibit

stereotypic movements. This view may be supported by the connection between level of functioning and etiology (lower functioning individuals are more likely to have an identifiable biological cause of mental retardation) and between level of functioning and stereotypic movements (lower functioning individuals are more likely to evince stereotypic movements).

Genetic/Chromosomal

In some cases mental retardation is a result of genetic or chromosomal abnormalities (Abuelo, 1991). Genetic disorders may be of three types: 1) single gene disorders, 2) multifactorial problems, and 3) chromosomal disorders. Single gene disorders include dominant gene disorders (neurofibramatosis and myotonic dystrophy), recessive gene conditions (Phenylketoneuria, galactasemia, and Tay-Sachs disorder), and x-linked disorders (Fragile x syndrome, nonspecific x-linked disorders, and Lesh-Nyhan syndrome). Multifactorial problems result from an interaction between genetics and environmental factors. An example of this type of difficulty is spina bifida. Chromosomal disorders associated with mental retardation include Down's syndrome (result of Trisomy 21) and Kleinfelter's syndrome (result of XXY on chromosome 47).

Familial/Environmental

Approximately 70-80 % of individuals diagnosed with mental retardation fall into the mild and moderate ranges (Rowitz, 1991). Of these people, etiology is unknown for most cases (Rowitz, 1991). In cases of unknown etiology it is generally hypothesized that the impairments are a result of disadvantaged life circumstances or an impoverished environment. Some factors likely affecting the individual's functioning level include abuse, malnutrition, low socioeconomic status, parents or siblings with mild mental retardation, lack of reinforcement of appropriate behaviors, lack of appropriate models, inappropriate materials to promote learning, low expectations, large families providing insufficient care, overcrowding, mental or physical illness in both parents, low educational level of parents, and institutional placement (Rowitz, 1991). The environmental and familial variables mentioned here may result in less attention and education in the child's environment, models who are low achievers, and learning of inappropriate and oftentimes ineffective behaviors and coping strategies.

Other Etiological Factors

Mental retardation may also result from numerous complications during the pre-, peri- and postnatal periods. Pre and peri-natal factors

include infections, brain injury, biochemical disorders, disorders of the central nervous system, and birth injury (including peri and intraventricular hemorrhages) (Menke, McClead, & Hansen, 1991). Some of these factors are especially associated with premature birth (Ahmann, Lazzara, Dykes, Brann, & Schwartz, 1980). Exposure to toxins has also been implicated as a causal factor of mental retardation (Menke, McLead, & Hansen, 1991). Such exposure may occur during the prenatal (alcohol, anticonvulsants, radiation, maternal PKU, and drugs of abuse) or postnatal period (lead). Additionally, infections following birth may result in mental retardation, if there is damage to the central nervous system (Scola, 1991).

Based on the preceding discussion, it should be clear that mental retardation may result from numerous influencing/causal factors. Etiology provides the clinician with some information about factors contributing to impairments (ie., brain pathology, genetic disorders, familial/environmental factors). Additionally, individuals with a known biological cause tend to evince greater deficits in functioning.

Although the degree of impairment may vary, researchers and clinicians agree that individuals diagnosed with mental retardation evince deficits/delays in numerous functioning areas. These individuals also

engage in numerous problematic behaviors that interfere with learning and impede adaptive functioning (Matson & Mulick, 1991). Problematic behaviors include (but are not limited to) aggression, self-injury, pica, rumination, property destruction, and stereotypic movements. The prevalence of these difficulties in individuals with mental retardation is significantly higher than that in the general population with stereotypic movements being the most prevalent (Gardner & Cole, 1990; Schroeder, 1991). Additionally, individuals with mental retardation are more likely to have secondary diagnoses of other mental disorders (Borthwick-Duffy, 1994) Dual diagnosis is associated with a greater number of problematic behaviors (Borthwick-Duffy, 1994). Reduction of problematic behaviors in these individuals has been investigated by numerous researchers (Carr & Durand, 1985; Day, Horner, & O,Neill, 1994; Foxx & Azrin, 1973; Foxx, McMorrow, Fenlon, & Bittle, 1986; Kennedy, 1994; Mace, Lalli, Lalli, & Shea, 1993; Matson, Sevin, Fridley, & Love, 1990; McEntee, Parker, Brown, & Poulson, 1996).

Although numerous problematic behaviors can be observed in individuals with mental retardation, not all of them have received equal coverage in the literature. Those which are potentially injurious and disruptive to staff routine including aggression, property destruction, and

self-injury receive the most attention (Mulick, et al, 1991; Schroeder, 1991)). One behavior that is often long-lasting , generally more resistant to change, highly prevalent, pervasive across multiple situations in the individuals daily life, associated with a dually diagnosed condition, but often overlooked as a "real problem" area is stereotypic behavior.

Stereotypic Movement Disorder

Stereotypic behavior consists of repetitive motor or vocal responses (Schroeder, 1970; Schroeder, 1991). Topography of the behavior will vary including whole body movements (body rocking, twirling), other repetitious movements (head rolling), nonrepetitive movements (limb and body postures, sucking fingers or toes, eye poking), gazing at hand movements, repetitive manipulation of objects, and repetitious utterances of meaningless sounds (Berkson, 1967; Schroeder, 1991). The defining features are that the behavior occurs repeatedly, often continuously throughout the individual's day, and has no apparent functional utility for the individual (it is not a behavior that will increase the individual's abilities or independent functioning). Stereotypic movements have been described using many different labels including mannerisms, motility disturbances, ritualistic acts, rhythmic habit patterns, blindisms and autisms (Lovaas, Newsom, & Hickman, 1987). Many individuals engage in more than one type of stereotypy. Body rocking and repetitive sounds are the most frequently observed stereotypic behaviors, although approximately 50 topographies with varying degrees of complexity have been observed (LaGrow & Repp, 1984).

Stereotypies become a diagnosable condition and one of concern if it interferes with the individuals ability to function within his/her environment (APA, 1994; Schroeder, 1991). When this occurs, the stereotypic behavior generally decreases the time the individual is engaged in functional activities as he/she spends a greater amount of time engaging in the stereotypy (Schroeder, 1991). Given the move toward teaching independent behavior, interference with functional activities is a big problem. While engaged in stereotypic behavior, the individual is generally unresponsive to interaction attempts (Watkins & Konarski, 1987). Any verbal and physical prompts by a trainer or other individual will not elicit a response from the individual in most instances. If the individual does respond, it is typically only for a short time and then he/she will return to the stereotypic behavior. Initiation of any other activities is generally not independent (without verbal or physical prompting). When left alone or not given an alternative task to complete, the individual will likely choose to engage in the stereotypic behaviors. Attempts to direct the individual to other tasks is complicated by the difficulty of discovering tasks that will compete with the stereotypic movements in terms of "enjoyment" or reinforcement (Watkins & Konarski,

1989). This difficulty is due to the individual's tendency to choose stereotypies over most other tasks when given the choice.

Because it is difficult to distract and redirect individuals who engage in stereotypic movements, training is made more difficult (Watkins & Konarski, 1987). Most training tasks require the trainer to issue verbal and physical prompts to complete a task. As stated earlier, individuals engaged in stereotypic behaviors tend not to respond to such prompts. If a response is made it is usually short-lived; thus, any training tasks requiring sustained attention are even more difficult to complete. When a task is completed, it is most often the result of consistent and repetitive prompting and attention from trainers. Considerable amounts of staff time are necessary to complete such a process.

The pervasive nature of stereotypic movements along with the difficulty in redirecting this behavior and initiating training tasks can be even more taxing on staff resources when presented with multiple individuals presenting with this difficulty. A discussion related to prevalence estimates for stereotypic movement disorder in individuals with mental retardation will help to highlight this concern.

Prevalence

Stereotypic movement disorder is one of the most frequently co-occurring conditions in individuals with mental retardation. Diagnosis of the disorder becomes more prevalent as functioning level decreases and residential placement becomes more restrictive (Johnson & Day, 1992). Thus, individuals with severe and profound mental retardation are more likely to exhibit stereotypic behaviors than those functioning in the mild and moderate ranges of mental retardation, just as individuals residing in institutional settings are more likely to exhibit these behaviors than those in community settings. Without treatment, increases with age may also be observed.

Estimates of stereotypic movement disorder range from 13% to 75% depending on the specific subgroup being discussed (Berkson & Davenport, 1962; Kaufman & Levitt, 1965; Repp, Barton & Gottleib, 1983; Schroeder, 1991). Estimates around 13% refer to individuals residing in community settings (Repp, et al, 1938), while estimates around 75% are noted for individuals residing in institutional settings (Berkson & Davenport, 1962; Kaufman & Levitt, 1965). When estimates for individuals with mental retardation are grouped regardless of severity level the estimate tends to be approximately 18% (Schroeder, 1991).

However, this estimate increases to about 40% when severity levels in the severe to profound range are considered in isolation (Schroeder, 1991). These stereotypic behaviors tend to occur during 7-47% of the time the individuals are observed (Repp & Barton, 1980).

In contrast to these figures, prevalence estimates for the general population are low (Matson & Mulick, 1991) When stereotypic behaviors do occur in the general population, it is usually in persons 6 months to 2 years of age (Matson & Mulick, 1991). These behaviors generally disappear with age. However, adults may continue to engage in what is considered "socially acceptable" stereotypies such as pencil tapping.

Differential Diagnosis

Prior to diagnosing a stereotypic movement disorder, other similar conditions must be ruled-out as a causal factor of repetitive movements and vocalizations. These conditions include pervasive developmental disorders, obsessive-compulsive disorder, simple and complex motor tics, involuntary movements associated with neurological conditions, and appropriate self-stimulatory behaviors (Schroeder, 1991).

Pervasive Developmental Disorders

Pervasive developmental disorders include those conditions characterized by impairments across several areas including social

interaction skills, communication skills, and repetitive behaviors. The social interaction difficulties range from total lack of interaction to rigidity in the presence of affection/touch to problems interpreting and empathizing with others' facial expressions and emotions. Communicative difficulties include total lack of communication, difficulty with nonverbal communication such as eye contact and body postures, and difficulties initiating and maintaining conversations. The repetitive behaviors may simply refer to a restricted range of interests or may include engaging in stereotypic movements. These impairments are pervasive across all situations and people and interfere significantly with the individual's functioning. Autism disorder, Rett's disorder, Childhood Disintegrative disorder, Asperger's disorder, and pervasive developmental disorder not otherwise specified are among the pervasive developmental disorders that may be diagnosed (APA, 1994; Cantwell & Baker, 1989; Cantwell, Russell, Mattison, & Will, 1979; World Health Organization, 1987). The degree to which each area of impairment is manifested in each of the disorders varies. In fact, many researchers and clinicians refer to this group of disorders as the "autistic spectrum" with pervasive developmental disorder NOS falling on the less severe end of

the spectrum and "classical" autism falling on the more severe end. All other difficulties would fall somewhere between these two extremes.

Because stereotyped movements and vocalizations are part of the diagnostic criteria for these disorders, they must be considered and ruled-out before a diagnosis of stereotypic movement disorder can be made. Typically, the stereotypic movements observed in autistic individuals will be more ritualistic in nature and more complex (ie., lining things up, arranging and rearranging items). Additionally, the social difficulties are usually a key diagnostic criteria for a diagnosis of autism or any other pervasive developmental disorder.

Obsessive-Compulsive Disorder

Obsessive-compulsive disorder is defined by intrusive and inappropriate thoughts that are anxiety-provoking and may result in repetitive behaviors to reduce the distress (Sturgis, 1993). The repetitive behaviors seen in obsessive-compulsive disorder are not unusual in topography (ie., hand washing, checking, counting), but rather in intensity. They are behaviors most individuals perform during functional activities, while the compulsive individual performs them to excess (ie., 50 times per day).

If an individual is exhibiting repetitive behaviors in response to an obsession, he/she would more accurately be diagnosed with obsessive-compulsive disorder as opposed to stereotypic movement disorder. However, in individuals with severe and profound mental retardation, it is often difficult to document and diagnose obsessive thoughts due to impaired receptive and expressive language skills (Matson, et al, 1997; Whitman, Sciback, & Reid, 1983). As stated earlier, the topography does allow for some differentiation. Thus, if the individual is engaging in excessive body rocking, it is more likely that he/she has stereotypic movement disorder, than if he/she is constantly counting items or hand washing.

Simple and Complex Motor and Vocal Tics

Tic disorders include those characterized by "a sudden, rapid, recurrent, nonrhythmic, stereotyped motor movement or vocalization" (Berkow, 1992). They are generally experienced as irresistible, although they can be suppressed for certain lengths of time and tend not to occur during sleep. Stress may exacerbate tics, while other enjoyable activities may decrease the likelihood of exhibiting tics.

Simple tics include eye blinking, knee jerking, shoulder shrugging, face grimacing, coughing, throat clearing, grunting, sniffing, snorting, and

barking. Complex tics include facial gestures, grooming behaviors, jumping, touching, stamping, smelling an object, repeating words or phrases out of context, copralalia (use of socially unacceptable words, frequently obscene), palilalia (repetition of one's own words or sounds), echolalia (repetition of the last-heard sounds, word or phrase), and echokinesis (repetition of someone else's movements). The tics may originate in youth as simple tics and later develop into more complex motor and vocal tics.

Tics are similar to stereotypic movements because both may be vocal or motor in nature as well as a combination. Additionally, tics and stereotypic movements occur repeatedly. However, tics can generally be differentiated from stereotypies based on rhythm and volition. Stereotypies tend to be more voluntary ("driven and intentional") and rhythmic than tics.

Involuntary Movements Associated with Neurological Conditions

Some neurological conditions such as Huntington's Chorea and Parkinson's disease are characterized by some repetitive movements (Berkow, 1992). However, it is generally not difficult to differentiate these movements from stereotypic behaviors. Movements associated with neurological conditions include hand tremors, facial grimacing, and

flicking movements of the extremities usually following a typical pattern. These movements are involuntary in nature as opposed to the volitional movements associated with stereotypies. Some movements associated with neurological conditions only occur when the individual attempts to initiate some other movements (ie., hand tremors when reaching for something). Also, other signs of the condition are present to aid the diagnostician in recognizing the neurological disorder (Berkow, 1992).

Appropriate self-stimulatory behaviors

Some groups of individuals will engage in stereotypic behaviors as a form of self-stimulation that do not interfere with functioning (LaGrow & Repp, 1984; Schroeder, 1991). These groups include young children and infants and individuals with sensory deficits. Young children and infants generally outgrow these self-stimulatory movements. Those movements that continue are typically "socially acceptable" movements such as pencil tapping. Individuals with sensory deficits generally engage in these behaviors in a limited manner that does not interfere with their functioning and do not become a focus of treatment. Differentiating appropriate self-stimulatory behaviors from those characterizing stereotypic movement disorder is based on clinical judgment of the effects of the movement on the individual's independent functioning. A diagnosis is generally not

given unless it interferes in some way with training, work or social interactions.

Etiology

Discussions regarding the etiology of stereotypic movements generally center around two main groups of hypotheses: physiological and behavioral (Berkson, 1983; Guess & Carr, 1991a; Guess & Carr, 1991b Lovaas, Newsom, & Hickman, 1987; Schroeder, 1991). In recent years, there has been some attempt to integrate the two approaches (Guess & Carr, 1991a). The following is a presentation of the two groups of theories as well as a description of an integrated approach. It is important to clarify that most research regarding the etiology of stereotypic movement is mixed with that surrounding self-injurious behavior as well. This combination of the two behavioral difficulties clouds the picture as recent research has indicated that they may be two separate phenomenon. Research suggests that all self-injury does not derive from earlier stereotypic movement and in fact may not be repetitious and rhythmic at all (Mulick & Meinhold, 1991).

Physiological Hypotheses

Three physiological hypotheses have been discussed in the literature including homeostatic/arousal hypotheses, rhythmic-invariant

movement and faulty modulation hypotheses, and sensory integration hypotheses (Guess & Carr, 1991a; Lewis & Baumeister, 1982; Schroeder, 1991). All three hypotheses suggest that the development of stereotypic movement is a logical extension of biobehavioral systems involved in self-regulation (Schroeder,1991). These hypotheses tend to be derived from research utilizing animal research, but research using human subjects tends to be less supportive.

The homeostatic/arousal hypothesis refers to the emergence and maintenance of stereotypic movements as a form of self-stimulation or arousal reduction (Guess & Carr, 1991a; Lewis & Baumeister, 1982; Schroeder, 1991). This interpretation is based on the assumption that we all have an optimal level of stimulation or arousal. The stereotypic movement(s) are thought to be an attempt to counterbalance an over or understimulating environment. Any form of self-stimulation is supposed to increase arousal in understimulating environments and decrease arousal in overstimulating environments. Research investigating this position is clearly difficult.

The rhythmic-invariant movement hypothesis refers to the emergence and maintenance of stereotypic movement as a function of a central nervous system motor program, while the faulty modulation

hypothesis suggests that stereotypic movement develops from problems with the modulation of the extrapyramidal motor system as a result of supersensitivity of the dopaminergic receptors in the nigrostriatal pathway (Guess & Carr, 1991a; Lewis & Baumeister, 1982; Schroeder, 1991). Both hypotheses are based on the idea that early in development one or more neuronal systems were disrupted. In these theories, the stereotypy is not adaptive or functional but is a result of the pathological neuronal system(s).

The sensory integration hypotheses proposes that reduced/no stimulation during the early years of a child's life and/or deficits in sensory or motor systems disrupts the individual's ability to process sensory stimuli (Guess & Carr, 1991a; Lewis & Baumeister, 1982; Schroeder, 1991). This difficulty in processing sensory stimuli leads to further decrements in stimulation.

Behavioral Hypotheses

In contrast to the physiological hypotheses, behavioral interpretations of stereotypic movement suggest that stereotypic movement develops and is maintained by environmental contingencies (Guess & Carr, 1991; Schroeder, 1991). Lovaas, Newsom, and Hickman (1987) provide a thorough review of these hypotheses. The

environmental contingencies operating may be internal or external in nature. Internal contingencies refer to the idea that stereotypic movement is derived from the reinforcing effects of the stimulation itself, while external influences involve social consequences of the stereotypic movement including attentional and escape-related consequences. The maintaining factors of the stereotypic behavior will differ across individuals with some being internally reinforced while others are externally reinforced. However, most stereotypic behavior appears to be maintained by some internal reinforcing properties of the behavior. Weiseler, Hanson, Chamberlain, and Thompson (1985) polled direct care staff members in institutional settings and noted that 92% of stereotypic movements were thought to be "self-stimulatory" or regulated by internal sensory consequences, while 4% were thought to be reinforced by escape from unpleasant tasks and 3% were thought to be reinforced by attention from staff.

Support for the behavioral hypothesis comes from treatment research regarding stereotypic movement disorder. Studies investigating the effects of the presentation of alternative reinforcers or activity, use of punishment techniques following exhibition of stereotypic movement, and removal of reinforcing factors (ie., sensory stimulation, escape or

attention) have resulted in significant decreases in stereotypic responding (Barkley & Zupnik, 1976; Baumeister & Forehand, 1972; Charlop, Kurtz, & Casey, 1990; Horner, 1980; Hung, 1978; Kelleher, 1961; Koegel, Firestone, Kramme, & Dunlop, 1974; Lovaas, Schaeffer, & Simmons, 1965; Matson & Stephens, 1981; Repp, Deitz, & Speir, 1974). Treatments addressing alternative reinforcement/activity and blocking of sensory stimulation during stereotypic responding are thought to address the internal reinforcement of stereotypic responding while treatments addressing the withholding of escape or attention following stereotypic responding address issues of external reinforcement. Punishment techniques may address either issue as use of the technique following stereotypic responding is designed to decrease the likelihood that the individual will engage in the behavior regardless of the source of reinforcement. These studies lend support to the behavioral hypothesis because they include successful treatment of stereotypic responding through changing of environmental contingencies.

Integrative Model

In an attempt to integrate the physiological and behavioral approaches, Guess and Carr (1991a) developed their "conceptual model"

of the development and maintenance of stereotypic movements. The model views stereotypic movements as being on one of three levels.

The model suggests that stereotypic movements emerge in level one as part of the behavior state continuum. The individual would transition into level two stereotypies when he/she becomes more aware of and aroused by the environment. The final transition into level three would represent a more focused awareness of the environment. Not all individuals would progress through all three levels according to Guess and Carr's model, as the necessary awareness would need to be present for the transitions to occur. Many researchers have applauded Guess and Carr's attempt to integrate the physiological and behavioral approaches. However, most also criticize them for not providing a comprehensive and accurate picture (Lovaas & Smith, 1991; Mulick & Meinhold, 1991).

Several difficulties exist with reference to the model proposed by Guess and Carr including the following: 1) Their presentation provides a simplistic look at the operant perspective as simply a series of interconnected stimulus-response bonds that does not take into consideration internal organismic variables (Fentress, 1976; Hull, 1943; Keller & Schoenfeld, 1950; Lovaas & Smith, 1991); 2) Guess and Carr's view of social reinforcers maintaining stereotypies at Level III is

inadequate. While it is sometimes true that stereotypies or other behavioral concerns are motivated and/or maintained as a method of communication, this is not always true (Epstein, Taubman, & Lovaas, 1985; Lovaas & Smith 1991); 3) Guess and Carr's theory does not appear to be comprehensive enough to encompass all developmental, maintenance, and training possibilities; 4) Guess and Carr also fail to provide a thorough review of the theories of the development and maintenance of stereotypic movement as they fail to mention the role of drugs, hormonal responses and neurochemical events as either stimuli or reinforcers in the process, the differences in reinforcer sensitivity across individuals, and the effects of illness or physical discomfort in behavioral expression (Cataldo & Harris, 1982; Mulick & Meinhold, 1991; Romanczyk, 1986); 5) Guess and Carr's model does not adequately integrate these variables in a manner that allows the reader to ascertain their function. Additionally, the absence of a reference to the potential self- reinforcing qualities of stereotypic movement through self-stimulation in Guess and Carr's model is somewhat perplexing.

In conclusion, a model that links biological and behavioral variables in a cyclical manner, but allows for the individualization necessary in understanding the development of stereotypic movement

across different individuals would likely be more applicable and useful. In other words, a model that looks to an interaction between arousal mechanisms and learning is needed. Thus, stereotypic movement may, for a given individual, be initially motivated by a need for increased arousal (or a lack of appropriate stimulation). It is only through an association with subsequent increased arousal either through self-reinforcement or attention from others following the behavior that the individual's stereotypic behavior will increase.

In an effort to better understand the emergence of stereotypic movements, some clinicians and researchers have turned to the literature on self-injurious behavior (Schroeder, 1991). Self-injurious behavior may accompany stereotypic movements and occur repetitively (Schroeder, 1991). Additionally, since self-injurious behavior causes physical damage to the individual, it has received more attention in the literature (Baumeister & MacLean, 1984; Mason & Iwata, 1990; Pace, Iwata, Edwards, & McCosh, 1986; Schroeder, 1991; Smith, Iwata, Goh, & Shore, 1995). A review of the major causal factors for self-injurious behavior will follow.

Etiology of Self-injurious Behavior.

Self-injurious behavior involves the repetitive exhibition of behaviors that result in injury to the self (Mason & Iwata, 1990; Schroeder, 1991). These behaviors include head banging, slapping, biting self, pinching self, and scratching oneself. Several theories have been proposed regarding the causes of self-injurious behavior. These theories include environmental/ stimulation, biological, and communicative theories (Baumeister & MacLean, 1984; Mason & Iwata, 1990; Schroeder, 1991).

Environmental/Stimulation Theories

A relationship often exists between stimulation or activities available in the individuals environment and the exhibition of self-injurious behavior (Baumeister & MacLean, 1984). Most individuals who engage in self-injurious behavior, particularly those residing in institutional settings, are inactive most of the time. The increased prevalence of self-injurious behavior in institutional settings supports this view (Schroeder, 1991). This connection between inactivity and self-injurious behavior has led some researchers to speculate that the inactivity may precede and contribute to the development of the self-injurious behavior (Baumeister & MacLean, 1984; Klaber & Butterfield, 1968).

Support for this causal contribution of lack of environmental or sensory stimulation to the development and maintenance of self-injurious behavior derives from two sources. The first source is the greater prevalence of self-injurious behavior in settings in which individuals remain relatively inactive for long time periods (Baumeister & MacLean, 1984; Klaber & Butterfield, 1968). The second includes treatment studies investigating the impact of increased environmental and sensory stimulation on the rate of self-injurious behavior. One such study was conducted by Baumeister and MacLean (1984). They used an exercise program in treating two males who resided in state institutional settings. These individuals exhibited self-injurious behavior in the form of slapping the head, face, chest or shoulders. The exercise program involved having the individual jog for an increasing period of time each day. Following the implementation of the procedure, rates of self-injurious behavior were lower than prior to use of the program.

Biological Theories

As with most maladaptive responses, biological theories have been proposed to explain the emergence and maintenance of self-injurious behavior (Ayres 1972; Ayres, 1974; Bright, Bittick, & Fleeman, 1981; Dura, Mulick, Hammer, 1988; Lemke, 1974; Norton, 1975; Wells & Smith,

1983). These theories relate the development of self-injurious behavior to central nervous system (CNS) dysfunction. Thus, poor sensory-motor integration has been hypothesized as the CNS difficulty involved. Proponents of this theory implicate presentation of various, integrated presentations of forms of sensory stimulation as treatment for self-injurious behavior.

Several researchers have investigated the effects of the above-mentioned treatment procedures on rate of self-injurious behavior (Bright, Bittick, & Fleeman, 1981; Dura, Mulick, Hammer, 1988; Lemke, 1974; Norton, 1975; Wells & Smith, 1983). These studies involved the presentation of visual, tactile, and auditory stimulation simultaneously to the individual during 15-minutes sessions. Successful decrease in rate of self-injurious behavior was documented in most instances. However, Mason and Iwata (1995) compared sensory integrative treatment with other behavioral treatments and found that effectiveness of sensory integrative therapy depended on the function of the self-injurious behavior exhibited. Their communicative theory is discussed next and illustrates this issue.

Communicative Theories

Other researchers have hypothesized that the exhibition of self-injurious behavior is related to communication of basic needs and desires (Mason & Iwata, 1990; Smith, Iwata, Goh, & Shore, 1995). Individuals who function in the severe to profound ranges of mental retardation are generally nonverbal and many lack any form of functional communication (Whitman , Sciback, & Reid, 1983). Thus, it has been suggested that some individuals
engage in aberrant behaviors including self-injurious behavior as a means of communicating basic needs and desires.

In examining this theory, researchers have discovered several possible communicative functions served by self-injurious behavior including attention, escape, tangible, physical, and nonsocial (Iwata, Dorsey, Slifer, Bauman, & Richman, 1994). These researchers have systematically investigated self-injurious behavior through the use of functional analysis techniques. Experimental analogue sessions in which the individual is exposed to situations involving exposure to situations in which attention, escape, and access to tangibles are available yet denied are used. Rates of self-injurious behavior are recorded in each session and compared to rate of self-injurious behavior when the individual has

continuous access to attention and tangibles and no demands are placed on him/her. Treatment can then be derived from the assessment of function. These authors have consistently demonstrated that treatment aimed at providing a replacement for the self-injurious behavior and extinguishing the reinforcement of the aberrant communicative response is successful in decreasing rate of self-injurious responding (Mason & Iwata, 1990; Smith et al, 1995). Individuals who engage in self-injurious behavior for nonsocial reasons may be more responsive to the sensory and environmental procedures mentioned previously (Mason & Iwata, 1995).

The uncertainty surrounding the etiological basis of stereotypic movements has made treatment of this disorder more difficult and much trial and error work has been conducted. As noted earlier in this proposal, stereotypic movements tend to be long-lasting in nature, occur across most activities/situations, and interfere with adaptive, independent functioning. Individuals who engage in stereotypic movements, particularly those with diagnosable rates of the behaviors, tend to have more difficulties acquiring new skills that may lead to greater independence due to the time spent engaged in the stereotypic behaviors (Schroeder, 1991; Watson & Konarski, 1987). Awareness of other

environmental variables seems to be decreased during these times. Although some would argue that stereotypic movements should not be of concern because they do not result in injury or property damage, it is the belief of many that interference with adaptive functioning (or independent functioning) should be a major concern for those working with individuals with developmental disabilities (Van Houten, Axelrod, Bailey, Favell, Foxx, Iwata, & Lovaas, 1988). The ultimate goal for any individual should be increased independence and greater environmental awareness. Based on these goals and the interference of stereotypic movements with the achievement of such goals, development of treatments/interventions that decrease time spent engaged in stereotypic behaviors is essential.

Treatment/Intervention

Historically, treatment research tends to focus more on operant conditioning as treatment (Barkley & Zupnik, 1976; Baumeister & Forehand, 1972; Charlop, et al, 1990; Horner, 1980; Hung, 1978; Kelleher, 1961; Koegel, et al, 1974; Lovaas, et al, 1965; Matson & Stephens, 1981; Repp, et al, 1974). These operant procedures have in the past included punishment techniques such as overcorrection, and time-out, although they are not used as often today. Currently, more positive procedures are favored unless there is substantial risk for injury

or damage which is generally not a concern for individuals who engage in stereotypic movement disorder. Researchers have attempted to include use of sensory and perceptual feedback through the view of stereotypic movement as self-stimulation or self-reinforcement, although these procedures tend to be integrated into traditional operant approaches (Berkson & Mason, 1963; Forehand & Baumeister, 1970; Horner, 1980).

The focus on operant procedures is supported by the connection of environmental events and manipulation even in arousal hypotheses. For example, if a person engages in stereotypic movements as a result of understimulation or underarousal in his/her environment, increasing environmental stimulation may help. Likewise, if an individual engages in stereotypic movements due to issues of overarousal, termination of difficult tasks or reduction of environmental stimulation may be indicated. Due to the sensory impairments of some individuals and the possibilities of differing responses to different types of environmental stimulation, treatment utilizing a variety of stimulation and reinforcement devices has been undertaken along with deceleration techniques and pharmacological interventions. The following is a review of research regarding treatment/interventions for stereotypic movement.

Aversive Procedures

Aversive procedures include any procedure utilized following the exhibition of stereotypic movements that decrease the likelihood that the stereotypic movements will occur again. Such procedures vary from verbal punishment to overcorrection (Barkley & Zupnick, 1976; Baumeister & Forehand, 1972; Koegel, et al, 1974; Lovaas, et al, 1965; Marholin & Townsend, 1978; Matson & Stephens, 1981). Based on the combined results of these studies, aversive treatment appears to be effective in decreasing rate of stereotypic movements.

Marholin and Townsend (1978) used physical restraint to intervene for stereotypic movements (twiddling) in an autistic child. The use of the restraint procedures was effective in reducing the rate of the stereotypic behavior. This study also compared effectiveness of restraint across two conditions (3 minute restraint vs 5 minute restraint). The shorter time span was as effective as the longer.

Matson and Stephens (1981) utilized an overcorrection procedure for treating stereotypic behaviors. The participant was an adult male with severe mental retardation who engaged in wall patting. He was required to engage in arm exercises following exhibition of the stereotypic behavior. Reductions in the rate of stereotypic behavior were observed

along with increases in positive responses (smiling and verbalizations). A second study demonstrating the same effects with three additional subjects was also undertaken. The second study also addressed generalization issues by having the subjects watch the treatment of others' stereotypic movement. Effects of this modeling procedure were not significant.

Time-out is a procedure frequently employed in the treatment of multiple problematic behaviors (Lagrow & Repp, 1984). A unique form of time-out (sensory extinction) is often used in treating stereotypic movements (Rincover, et al., 1979). Rincover and colleagues (1979) used this procedure for intervening with the stereotypic behaviors (finger and arm movements and plate spinning) of four individuals with developmental disabilities. The sensory consequences of the behaviors were removed in the following ways: a) masking of proprioceptive consequences of finger and arm movements by attaching a vibrator to the child's hand; b) masking the auditory sounds of plate spinning by placing carpet on the table; and c) masking the visual consequences of finger and arm movements by applying a blindfold or dimming the lights in the room. Decreases in rate of stereotypic responding were observed.

Baumeister and Forehand (1972) examined the effects of verbal reprimands ("no") on rate of stereotypic movements. Subjects included 6 individuals with severe mental retardation who resided in an institutional setting. A reversal design was used for each subject. Compared to a baseline condition, rate of stereotypic movements were significantly reduced following use of the verbal reprimand.

Based on the above discussion, it is clear that aversive procedures are effective in reducing the rate of stereotypic responses. However, the restrictiveness of these procedures often calls them into question, particularly when used in treating behaviors that are not dangerous or destructive. Current best practices in the field generally require that the least intrusive/restrictive, but effective procedure be used. Clinicians are often required to demonstrate use of more positive, less restrictive procedures prior to implementation of the aversive procedure. Additionally, the cost of continuing to engage in the behavior versus the cost of using the aversive procedure must be weighed (Department of Health and Human Services, Health Care Financing Administration, 1988; The Accreditation Council on Services for People with Disabilities, 1993; Civil Rights of Institutionalized Persons Act, 1980; Van Houten, 1988). These guidelines in combination with the current political climate

regarding treatment and care for the developmentally disabled tends to swing the pendulum in favor of more positive approaches. Additionally, these procedures are often time-consuming to implement with behaviors as high in frequency as stereotypic movements. Due to these difficulties, use of other treatment options has been explored.

Pharmacological Treatment

Pharmacological treatments sometimes face the same difficulties as aversive procedures as they are generally (by professional standards) placed at the most restrictive end of the treatment spectrum. However, much of the general public is more receptive to the use of medication than other aversive procedures due to the "absent" effect of the medication (Restraint can be seen, medication control cannot). The following is a review of attempts to use medication for the treatment of stereotypic movements along with a description of the aversive side effects that may result.

Historically, as with most pharmacological treatments for individuals with developmental disabilities, antipsychotic medications have been used in treating stereotypic movements (Lewis, Bodfish, Powell, & Golden, 1995). While research does indicate that neuroleptic medications may result in a decrease in stereotypic movements,

questions have been raised regarding the mechanism responsible for such a decrease (Lewis, et al, 1995). It is often difficult to separate the decrease in rate of problematic behavior from the general decrease in behaviors exhibited. Additionally, a subsequent increase in other more adaptive behaviors is not reported. Combine this with the potential aversive side effects of such medications including involuntary movement disorders, sedation, and increased seizure thresholds, and the use of such medications seems unwise (Gelenberg, Bassuk, & Schoonover, 1991). In light of this concern, investigators have more recently begun to look for other possible alternative medication for treating stereotypic movements.

Lewis and colleagues (1995) investigated the efficacy of Clomipramine, a serotonin uptake inhibitor, for treating stereotypic movements in individuals with mental retardation. Subjects included 10 individuals with severe or profound mental retardation residing in a state facility. The study compared clomipramine to placebo in rate of reduction of stereotypic behavior. This double-blind, placebo-controlled crossover study of clomipramine use resulted in significant reduction in rate and intensity of stereotypic movements.

Smith, Gupta, and Smith (1995) examined the effects of naltrexone on self-injury, stereotypy and social behavior for two women with developmental disabilities. Use of naltrexone was compared to baseline rate of responding (no medication) using a reversal design. Reductions in self-injury and stereotypies as well as increases in social responses such as smiling, eye-contact and toleration of touch were observed with naltrexone treatment.

Pharmacological treatment with medications other than neuroleptics may be associated with reductions in rate of stereotypic movements based on preliminary research (Lewis, et al, 1995; Smith, et al, 1995). Additional studies replicating these effects and documenting any aversive side effects of short- and long-term usage of these medications is necessary before any strong conclusions may be drawn.

Reinforcement Procedures

As mentioned before, historic and current trends in practice focus more toward use of positive approaches of treatment, particularly for noninjurious or nondestructive behaviors. Thus, some investigators have examined the effects treatment focusing on effects reinforcement procedures have on rate of stereotypic movements (Charlop, Kurtz, & Casey, 1990; Horner, 1980; Hung, 1978; Kelleher, 1961; Repp, Deitz, &

Speir, 1974). Reinforcement interventions tend to be one of four types: a) using the stereotypic responses as reinforcers for other behaviors; b) differentially reinforcing other behaviors; c) differentially, reinforcing incompatible behaviors; and d) using one of the above three procedures in conjunction with other types of interventions

One problem researchers and clinicians may encounter in using reinforcement to reduce stereotypic movements is the identification of appropriate competing reinforcers. Some researchers have attacked this problem by actually using the stereotypic responses themselves as reinforcers (Hung, 1978). In taking this approach, these investigators allow the individual to engage in stereotypic movements based on rate of other behaviors exhibited or on length of time not spent engaging in stereotypic movements. Hung (1978) successfully decreased rate of stereotypic movements while increasing sentence production by providing two autistic boys with tokens following spontaneous appropriate sentences. The tokens could later be redeemed for specified periods of time free to engage in stereotypic movements.

The other types of reinforcement strategies utilized involve use of some reinforcer to aid in decreasing the rate of stereotypic movements. Differentially reinforcing other behaviors (DRO) is a successful strategy

employed as part of treatment packages to address most difficult behaviors. DRO is a procedure in which reinforcement occurs following a specified time interval during which the targeted response does not occur (Horner, 1980; Kelleher, 1961; Repp, et al., 1974). DRO procedures are generally not used in isolation, although few studies have done so. These procedures typically increase effectiveness when used in conjunction with other procedures such as verbal reprimands, and other aversive consequences. When DRO procedures are used, it is essential that the researcher or clinician ensure that the time interval for reinforcement be short enough to allow for sufficient opportunities for reinforcement.

The goal may be twofold as with differentially reinforcing incompatible behavior (DRI). With DRI, the goal is not only to decrease rate of stereotypic movements, but also to increase rate of some other competing, more functional behavior. The effectiveness of this procedure has been demonstrated when used alone or in conjunction with other procedures (Azrin & Wesolowski, 1980; Baumeister & Forehand, 1971; Favell, 1973). However, like DRO, it tends to be most useful when combined with other interventions.

In general, reinforcement procedures are useful component of a total treatment package for decreasing rate of stereotypic movements. They also adhere to the philosophy of least restrictive treatment and use of positive approaches.

Environmental Approaches

While most of the procedures mentioned above have involved manipulating the consequences of a particular behavior, environmental approaches involve changing the antecedent or setting events (Horner, 1980). Researchers have consistently documented the effects of changing certain environmental variables on rate of stereotypic movements (Adams, et al., 1980; Belfiore, et al., 1993; Berkson & Mason, 1963; Davenport & Berkson, 1963; Forehand & Baumeister, 1970; Horner, 1980). In particular, research has focused on the effects of changing stimuli and presenting novel stimuli. Researchers have found that when objects are presented in a systematic manner and the individual is not overwhelmed by the number or intensity of such stimuli adaptive responses and attendance to the environment will increase, while problematic behaviors will decrease.

The selection of an environmental enrichment procedure as opposed to other types of treatment/intervention was based on the review

of several important issues. First, the current political focus lies on positive procedures for intervening with regard to behavioral difficulties (Department of Health and Human Services, Health Care Financing Administration, 1988; The Accreditation Council on Services for People with Disabilities, 1993; Ellis, 1982; Civil Rights of Institutionalized Persons Act, 1980; Van Houten, 1988). The use of environmental enrichment procedures fits with this prevailing viewpoint. Additionally, best practices regarding treatment issues often requires the utilization of least restrictive and intrusive procedures possible to achieve the desired effect (Van Houten, et al, 1988). Again, environmental enrichment procedures are in line with this philosophy of care. Also, due to the lack of danger or fear of injury with regard to stereotypic movements, it is difficult to justify the use of more restrictive or aversive procedures in most cases (Hobbs & Goswick, 1977). Finally, previous research using general environmental enrichment procedures has proved efficacious and preliminary research with the use of the sensory room is promising (Ashby, Lindsay, Pitcaithly, Broxholme, & Geelen, 1995; Adams, Tallon, & Stangl, 1980; Belfiore, Browder, & Mace, 1993; Berkson & Mason, 1963; Forehand & Baumeister, 1970; Horner, 1980; Thompson & Martin, 1994).

Horner (1980) examined rate of stereotypic movements under three conditions, an enriched environment (toys and objects present), an enriched environment paired with DRO, and a control condition with no access to toys and objects. The stereotypic movements of five females with profound mental retardation were significantly decreased in both treatment conditions with rates being lowest in the environmental enrichment plus DRO condition. Studies by Berkson and Mason (1963), Belfiore and colleagues (1993) and Adams and colleagues (1980) utilizing similar procedures support these results.

Forehand and Baumeister (1970) investigated the effects of auditory and visual stimulation on rate of stereotypies. They found that high intensity sounds were associated with increased rate of stereotypy, a finding corroborated by other investigators (Higgenbottam & Chow, 1975; Hollis, 1971; Levitt & Kaufman, 1965). The reverse has also been found to be true. Low level sounds and quiet appear to be associated with lower levels of stereotypic movements (Adams, et al., 1980). Presentation of visual stimulation appears to be related to decreased rate of stereotypy.

Berkson and Mason (1963) investigated the effects of presented stimuli on rate of stereotypic responding. The study compared rate of

stereotypies in an alone condition, a condition of access to objects, a condition of access to objects with a noninteractive examiner present, and a condition of access to objects and social attention. Rate of stereotypies decreased as environmental stimulation increased.

Baumeister and MacLean (1984) examined the effects of environmental changes on rate of self-injury and stereotypic movement in a rather unique manner. The study involved institution of an exercise program for two adults with severe mental retardation. The use of the program was based on information suggesting that rate of stereotypies and self-injury are related to level of inactivity. Rate of self-injury and stereotypies decreased significantly during the implementation of the exercise program, while rates increased once the program was discontinued.

Based on the information found in numerous research studies it seems plausible that individuals who engage in stereotypic behaviors may do so as a form of self-stimulation of the senses (visual, auditory, proprioceptive). In 1975, Verheul developed the first multisensory room in Holland (Thompson & Martin, 1994). Although the original intent of the room was to provide individuals with developmental disabilities, sensory deficits, or emotional difficulties with a relaxing environment,

improvements in communication and social behaviors and decreases in need for medication were subsequently observed. Since that time, companies have begun to manufacture equipment for the set up of such rooms. Rompa does so under the trademark "Snoezelen." Two preliminary studies utilizing this equipment have been conducted. Numerous anecdotal reports and case studies support the results cited below.

Thompson and Martin (1994) examined the effects of the Snoezelen equipment on rate of stereotypic movements for six individuals with moderate learning disabilities. The purpose of the study was to identify preferred stimuli for each participant. Equipment utilized in the study included a rotating "disco" ball with a multi-colored spotlight, a slide projector with rotating special effects slide wheels, an aroma diffuser, relaxation music, two five-foot bubble tubes, fans, floor mats, and soft, flexible, vibrating tubes. Turning head toward object, stretching hand/arm towards object, raising head towards object, and leaning body towards object were characterized as behaviors indicative of preference. Turning head away from object, withdrawing hand/arm from object, lowering head away from object, and leaning body away from object were characterized as behaviors indicative of "dislike" for the object. Ten of the 11 stimuli

used were associated with preference behaviors, suggesting that these individuals may find the sensory equipment reinforcing.

Ashby, Lindsay, Pitcaithly, Broxholme, and Geelen (1995) observed the effects of the Snoezelen room on the behavior of eight individuals with profound mental retardation. The study was not designed specifically to decrease specific types of aberrant behavior, but to document possible effects of exposure to the Snoezelen room on the individuals ability to attend to a task. Improvements in concentration on a task were noted following Snoezelen sessions. The authors suggest that perhaps the 20-minute sessions may be too long as some individuals became restless during the session. Additionally, observers rated each participant's responsiveness to the Snoezelen room. A likert type rating scale from 0 or "no response" to 4 or "enjoying the session actively and being very responsive" was used. Observers rated 4 of the 20 sessions for each participant. These ratings were generally not related to scores on concentration. Most of the participants received scores from 1 to 4 with only 2 receiving a rating of 0 on 1 or 2 sessions.

In summary, stereotypic movement disorder is a common behavioral difficulty in individuals with mental retardation. Stereotypic responding is more prevalent among those individuals functioning in the

lower levels of mental retardation (ie., severe and profound). Multiple attempts at establishing causal factors for the presence of stereotypic movements have been made. However, continued investigation into the relationship between biological and behavioral factors is warranted. Regardless of etiology, treatment of this difficulty is imperative in increasing the individual's access to training and potential functional skills. Numerous treatments including aversive techniques, reinforcement procedures and environmental manipulations have been investigated with varying degrees of success. The most recent development in treatment focuses on alternative environmental stimulation which fits in with the current trend toward positive approaches in treatment. Preliminary research findings are promising. The addition of alternative means of stimulation into the environment of individuals with mental retardation does appear to be enjoyable or reinforcing to the individual, and increases in concentration/attention to tasks have been documented.

Purpose

The present study was an attempt to build on the existing literature regarding environmental enrichment as an intervention for stereotypic movements. First, the effects of exposure to the sensory room on rate of stereotypies was compared to a regular environmental enrichment probe and a control (no-treatment) group. Documenting effective interventions for reducing rate of stereotypic movements has important implications for structuring the environment and activity schedules of individuals who engage in these behaviors. Comparison across groups receiving different "treatment" allows clinicians and researchers to discover and utilize the procedures that result in the greatest reductions in stereotypic responding.

Follow-up data was collected so that differences between groups during a later observation could be examined. Examination of follow-up data allowed for the determination of length of treatment effect which may have implications for scheduling of training tasks.

Method

Participants

Forty-five individuals with mental retardation who reside in a state developmental center and engage in stereotypic behaviors were participants in this study. The individuals ranged in age from 20 to 76 and functioned in the profound range of mental retardation. Fourteen females and 31 males participated. Table 1 shows demographic information for each group and for the sample as a whole. An attempt was made to match subjects on the following characteristics: frequency of stereotypic movement and type of stereotypic movement. Frequency of stereotypic movement was be given priority in matching, followed by type of stereotypic movement. Based on the observational probe described later in this section, percentage of time spent engaging in stereotypic movements was estimated. Individuals were placed into groups of 3 based on similar estimates of frequency. Topography was given secondary consideration in the groupings. Once groupings were made, individuals were randomly assigned to one of the three groups described. Individuals with hearing or visual impairments were excluded from the study. These individuals were excluded because much of the sensory equipment is visual and auditory in nature. Such impairments would not

allow for the examination of the effects of multi-sensory stimulation. Consent for participation in the study was be obtained from their guardian and the facility (see Appendix A for informed consent form).

Table 1. Demographic Information

	Sample	Control	Placebo	Exper.
Age				
(Range)	20-76	30-70	27-65	20-76
Race				
Caucasian	32	10	11	11
African-American	13	5	4	4
Gender				
Male	31	11	11	9
Female	14	4	4	6
Level of MR				
Profound	45	15	15	15
No. with Physical Impairments	18	7	5	6
Type of Stereotypy				
Body Rocking	19	6	7	6
Head Turning	5	2	1	2
Hand Mouthing	7	2	2	3
Hand Flapping	5	2	2	1
Hand Rubbing	2	0	1	1
Vocalizations	9	3	3	3
Object Twirling	2	1	0	1
Hand Gazing	1	0	1	0

Participants were selected by the investigator following multiple observations (2-4 occasions) on the six units of the facility with

approximately 130 individuals on each unit. Each observation period consisted of the observer entering the area, sitting in an unobtrusive place, and observing and recording stereotypic movement by the individual. Criteria for inclusion in the study was exhibition of stereotypic behaviors for at least 50% of each of the observations

Dependent Variable

For the purposes of this study, stereotypic behaviors were defined as repetitive motor behavior. Stereotypic movements were operationally defined as one of the following: a) body rocking - movement of the upper body in a back-and-forth or side-to-side motion; b) head rolling - movement of the head back-and-forth or from side-to-side; c) hand mouthing - placing the hand in the mouth; d) repetitive manipulation of objects - holding an object and moving it from side-to-side or manipulating one part of the object such as wheel spinning; e) hand flapping - holding hand out to the side of the body or in front of the face and moving the hands back-and-forth or side-to-side ; and f) other repetitive limb movements - toe tapping, moving the leg back-and-forth or side-to-side, or moving arms back-and-forth or side-to-side. Behaviors that caused tissue damage or required the use of protective equipment were excluded.

The stereotypic movements were assessed based on observational sessions. The individual was observed for 4 ten minute sessions, and occurrence or nonoccurrence of stereotypic movement was noted for each minute of the observation. Additionally, topography of the behavior observed was documented. Those engaging in stereotypic movements for more than 50% of the time were studied. Assessment of the stereotypic movements during sessions following selection is described in the assessment and research design sections later.

Materials

Behavioral frequency data sheets were used to monitor the rate of stereotypic behaviors during pre-test, post-test, and follow-up (see Appendix B). Observers counted the frequency of stereotypic behaviors per minute for 10 minute sessions during pre-test, post-test and follow-up. For each incident of stereotypic behavior the observer placed a mark in the block on the data sheet which corresponded to the minute of observation. Stopwatches were used to time sessions.

The stimulation room contained no windows so that the observers were able to control the amount of light in order to provide optimal conditions for viewing the visual effects of certain items. The room had four walls and a door and was free from distractions (ie., other clients,

staff, noise). Items present in the stimulation room included a rotating "disco" ball with a multi-colored spotlight, a slide projector with rotating special effects slide wheels, a light spray, relaxation music, two five-foot bubble tubes, fans, floor mats, and soft, flexible vibrating tubes.

Observers

Observers were 4 post-masters psychology associates at the facility. All observers were trained by the investigator in observing and recording rates of stereotypic behaviors for each individual in the study. The observers were given verbal instructions regarding the rating system. Each observer rated the frequency of stereotypic movements for a single individual. Two raters recorded frequency simultaneously. Rates of stereotypic movements recorded by each observer were compared to one another. Both of the individuals rated the individual until they achieved 80% agreement. When the observers achieved an 80% agreement rate, they were considered ready to rate for data used in the study. Interrater reliability was calculated for 20% of the sessions.

Trainers

Four post-masters psychology associates were trained in implementing the treatment in the placebo-control and experimental groups. They were verbally instructed on how to verbally and physically

prompt the client, how to provide attention and access to items in the placebo-control group, and how to activate the stimulation equipment in the experimental group. They were observed implementing each procedure and were not considered ready to implement until they perform the procedures with 100% accuracy over 5 sessions. Additionally, following initiation of the treatment sessions, treatment integrity was assessed for 20% of the sessions.

Procedure

Assessment Times

Each subject was assessed three times. These was a pre-test, post-test and follow-up. The pre-test condition occurred for 4 consecutive days following selection. The post-test sessions occurred for 10 consecutive working days (Monday through Friday) following the pre-test sessions. Post-test was considered the 10 minutes immediately following exposure to the experimental condition. The follow-up sessions occurred during the same 10 days as the post-test sessions, but were held 1 hour after the post-test sessions.

The pre-test condition of the study involved observations of the participants in their natural environment. Each participant was observed for 8 ten minute sessions. Four sessions were conducted in the morning

and 4 were conducted in the afternoon. The observer(s) counted the number of stereotypic behaviors per minute and recorded each on the behavioral frequency data sheet.

Each group was also observed for 10 minute sessions immediately following exposure to the experimental condition (see next section for details) and during the 10 minute probes later in the day. Rate of stereotypic movement per minute was documented on the behavioral frequency data sheet. Observations during each of these 10 minute sessions allowed for the comparison of rates of stereotypies immediately after exposure to the experimental conditions and later in the same day.

Research Design

Following the pre-test session, each participant was matched with 2 other participants as noted earlier. Each of the 3 members of a yoked pair were randomly assigned to one of three experimental conditions: control, placebo-control, and treatment.

The control group continued to be observed for 10 minute sessions in the natural environment (normal conditions at the developmental center). The observer entered the home of the individual and observed unobtrusively from an area on the periphery. The individual was observed for 20 minutes. The first 10 minutes were considered exposure

to the control condition. The remaining 10 minutes involved collection of data on rate of stereotypic movement during the post-test phase. No contact was made with the individual or staff members during the 20 minute observation. The observation occurred during times when the individual was not involved in a training task.

The placebo-control group was observed in a quiet area away from other individuals for 10 minute sessions. During these sessions, other stimuli were present in the room (ie., television, radio, attention from the trainer, etc.) to control for effects of no stimulation on the rate of stereotypy. The trainer entered the room with the participant. A television or radio was turned on and the individual had access to items/activities in which to engage, as well as attention from the trainer. When the session began, the trainer verbally and physically prompted the individual to attend to the items in the room. Prompts were repeated once per minute during the 10 minute session if necessary. If prompts were not necessary, the trainer interacted with the participant once per minute by making some positive statement (ie., "I like how you are using the ball.") If the participant was wheelchair bound, any tangible items that were moved out of the participants reach, were recovered by the trainer and again placed within his or her reach. If the participant was not

wheelchair bound, but an item moved out of his/her eyesight, it was placed within eyesight by the trainer. Once the 10 minute session was completed, the observer watched the participant for an additional 10 minutes in which the activities (including the television and radio) were not accessible to the participant. Rate of stereotypic movement was recorded during this 10 minute post-test probe. Following the 10 minute post-test, the participant was returned to his/her normal daily activities. The placebo-control group allowed the investigator to examine the effects of simply moving the individual to a place away from others with the sole attention of a trainer.

The treatment condition consisted of exposure to the activated stimulation room for 10 minutes. The trainer entered the room with the participant. The stimulation equipment was activated and the trainer verbally and physically prompted the individual to attend to the equipment. Activated equipment included those that provide visual, auditory, and tactile stimulation. If the individual was wheelchair bound, the trainer provided access to the vibrating tubes to ensure exposure to all types of stimulation available. No other interaction was provided. Once the session was complete, the observer watched the participant for 10 minutes while the equipment was not activated. Rate of stereotypic

movement was recorded during this post-test session. Following this 10 minute post-test, the participant was returned to his/her normal daily activities.

Each group was exposed to the experimental setting for 10 sessions. The exposure over at least a two-week period allowed for the documentation of any changes over time following exposure to treatment.

Results

Two univariate analyses of covariance (ANCOVAs) were conducted to determine group differences during post-test with pretest sessions as the covariate. Average post-test scores were used in the analysis. The ANCOVA procedure allowed for a comparison of group differences while factoring out the variance accounted for by pre-test differences (Hinkle, Wiersma, & Jurs, 1994). The comparison is made possible by using multiple regression equations to compare the amount of variance accounted for by the treatment effects and the covariate versus the amount of variance accounted for by only the treatment effects. No significant differences were found between groups at post-test [$F(2, 44) = 1.187$, $p = .31$] or at follow-up [$F(2, 44) = 2.499$, $p = .10$]. Post hoc analyses were not conducted due to lack of significant differences between groups at post-test or follow-up.

Table 2. Group Means and Standard Deviations for Stereotypic Movements at Pre-test, Post-test, and Follow-up.

Group	Pre-test	Post-test	Follow-up
Control	18.7 (6.84)	19.9 (10.43)	20.6 (12.37)
Placebo	15.7 (8.89)	15.5 (11.38)	14.1 (11.07)
Experimental	18.5 (12.77)	15.7 (12.42)	16.2 (13.16)

Although no effects were noted at post-test or follow-up, some trends were observed during treatment sessions. Data regarding rate of stereotypic movements during these sessions lends support to such trends. First, rate of stereotypic movements decreased significantly (more than 2 standard deviations when compared to the mean baseline score) for no controls, 5 placebo participants, and 7 experimental group participants. Thus, responders and nonresponders could be identified for both the placebo and control groups. To determine if the differences between the three groups were significant, a chi-square analysis was conducted. The chi-square yielded significant results [$x (2) = 7.86$, $p < .05$]. Based on review of residual effects, the control group differed significantly from the placebo and experimental groups. The placebo and experimental groups did not differ significantly from one another. Figures 1 through 5 contain individual data for baseline and treatment sessions for each subject in each group. It is also interesting to note that there were some predictors of response in the experimental group. Topography of behavior appeared to be indicative of response as indicated by the lack of inclusion of any body rockers or head turners in the responders group. Additionally, individuals with less frequent and less intense stereotypic movements appeared to respond more positively to the sensory room. Such predictors were not as reliable for the placebo group.

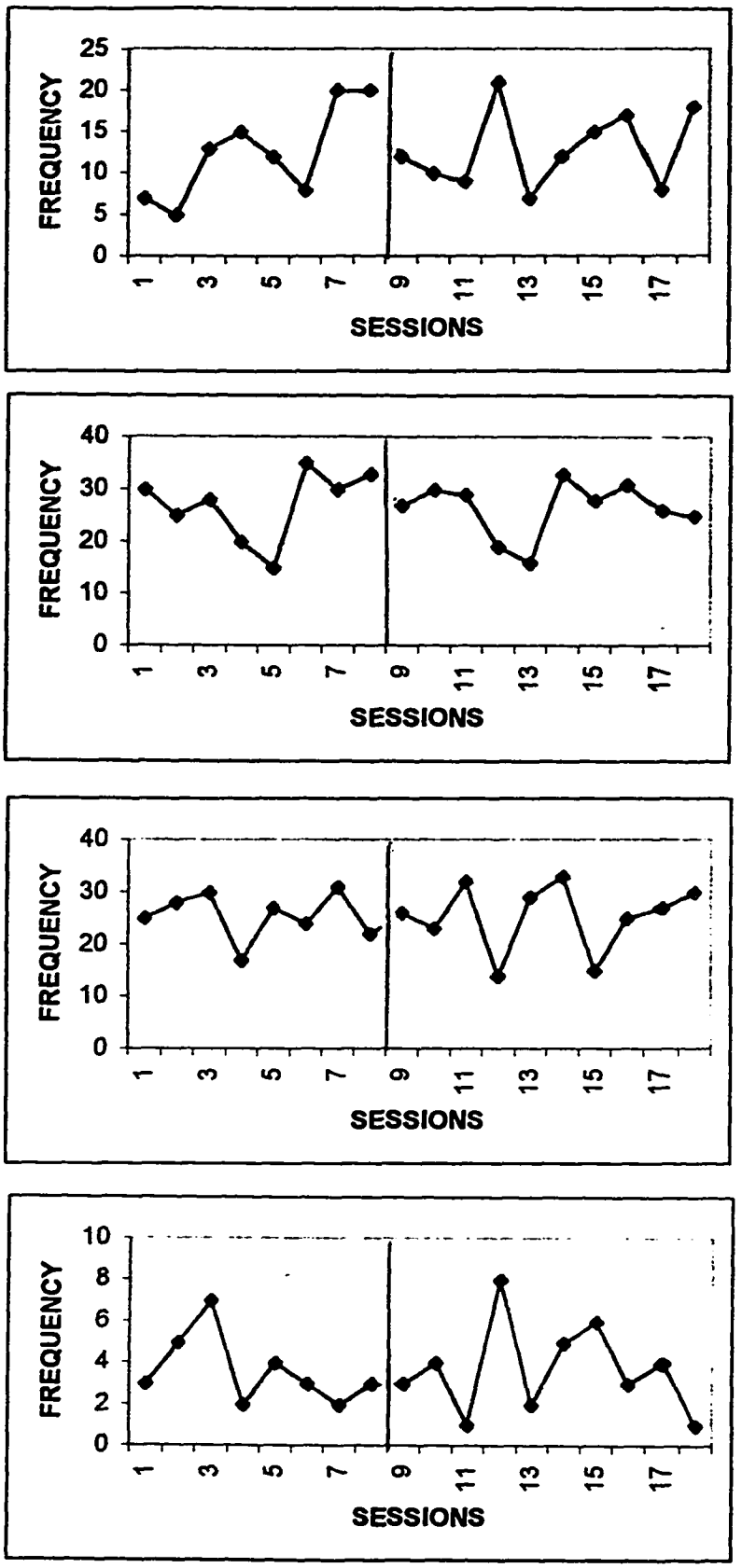
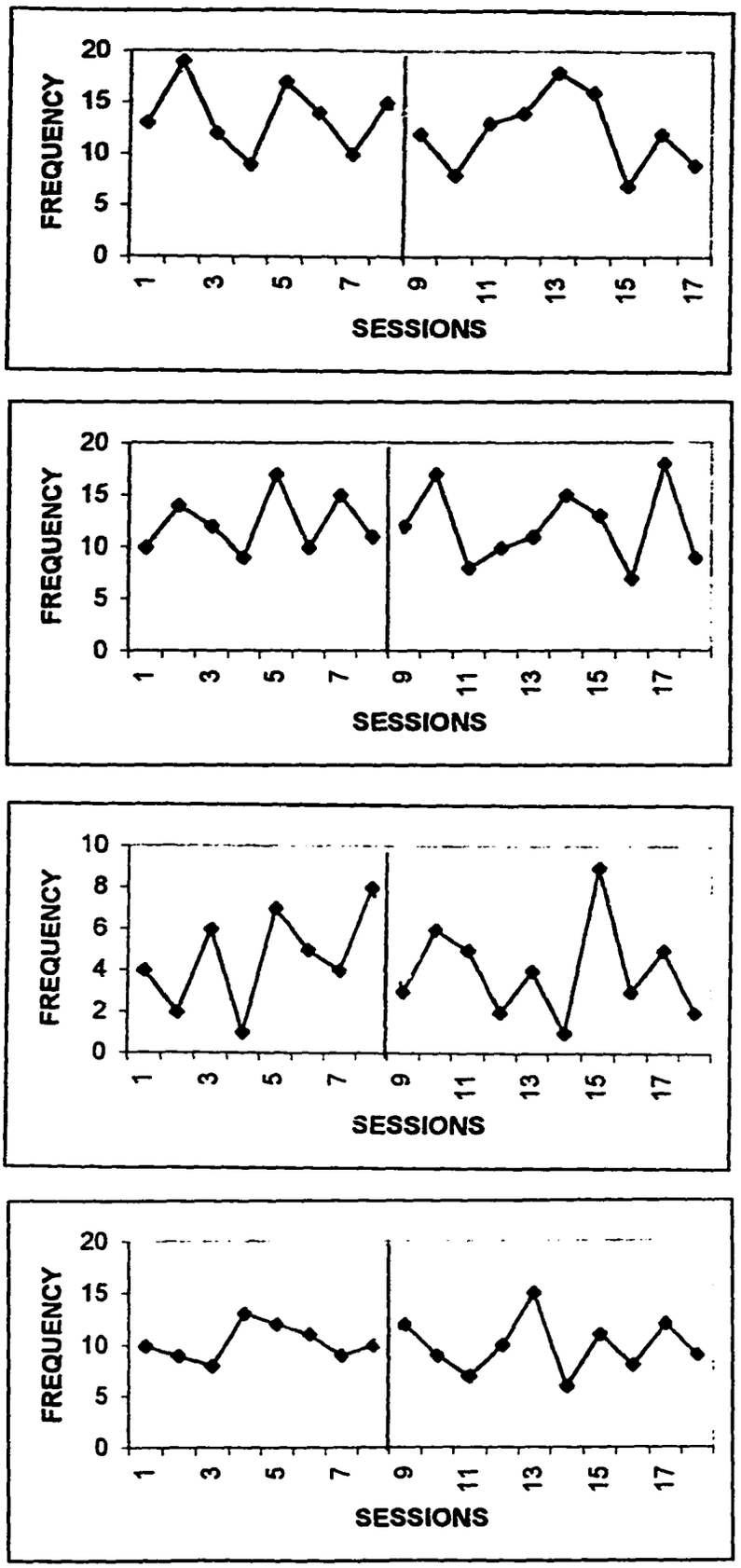


Figure 1. Comparison of Baseline Rate of Stereotypic Movement to Rate During Treatment Session for Controls.



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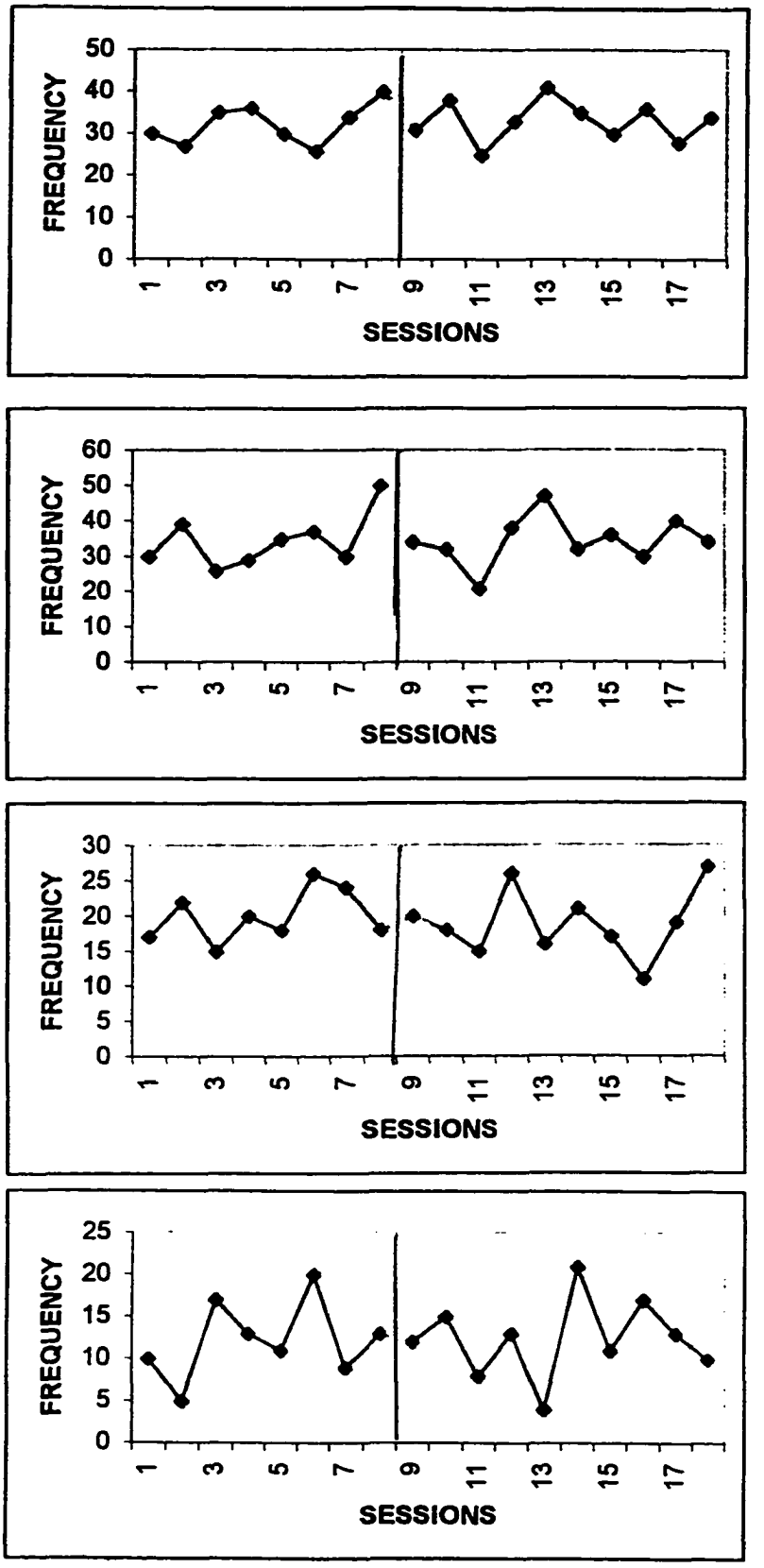

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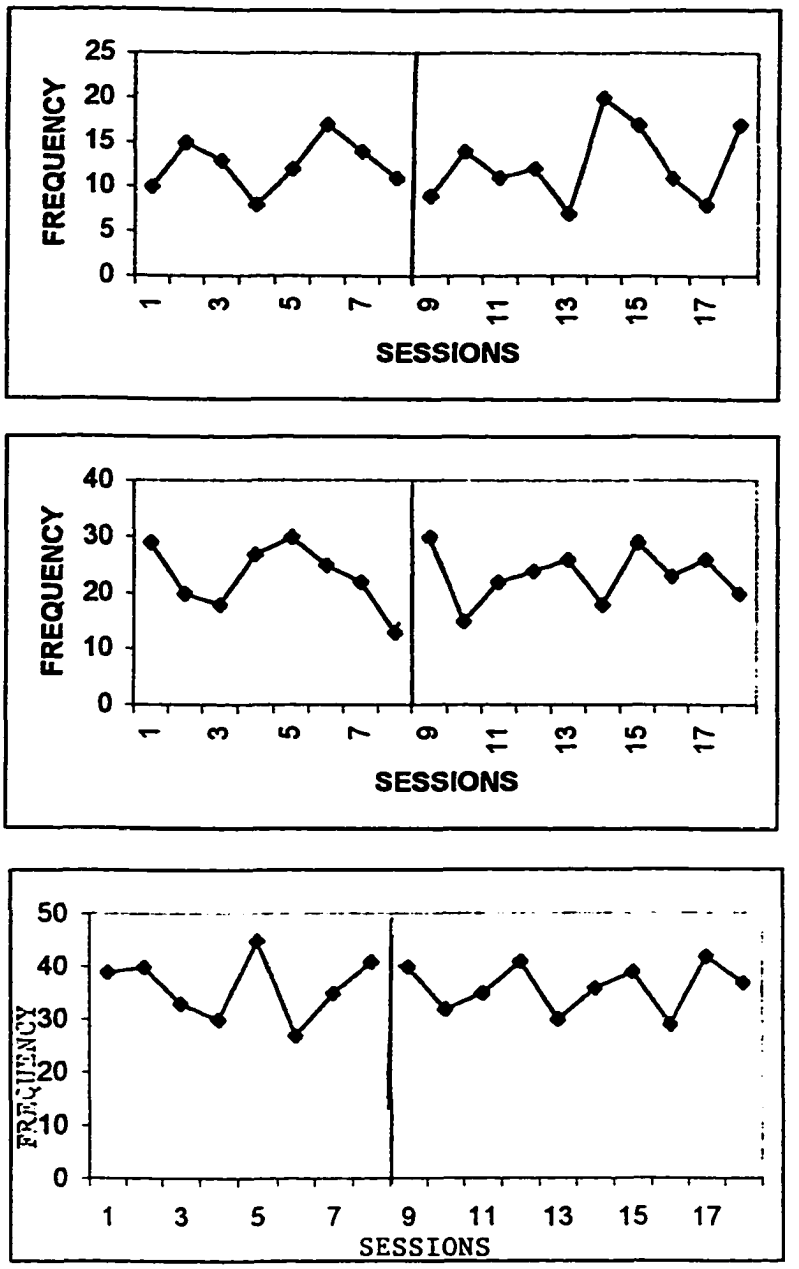

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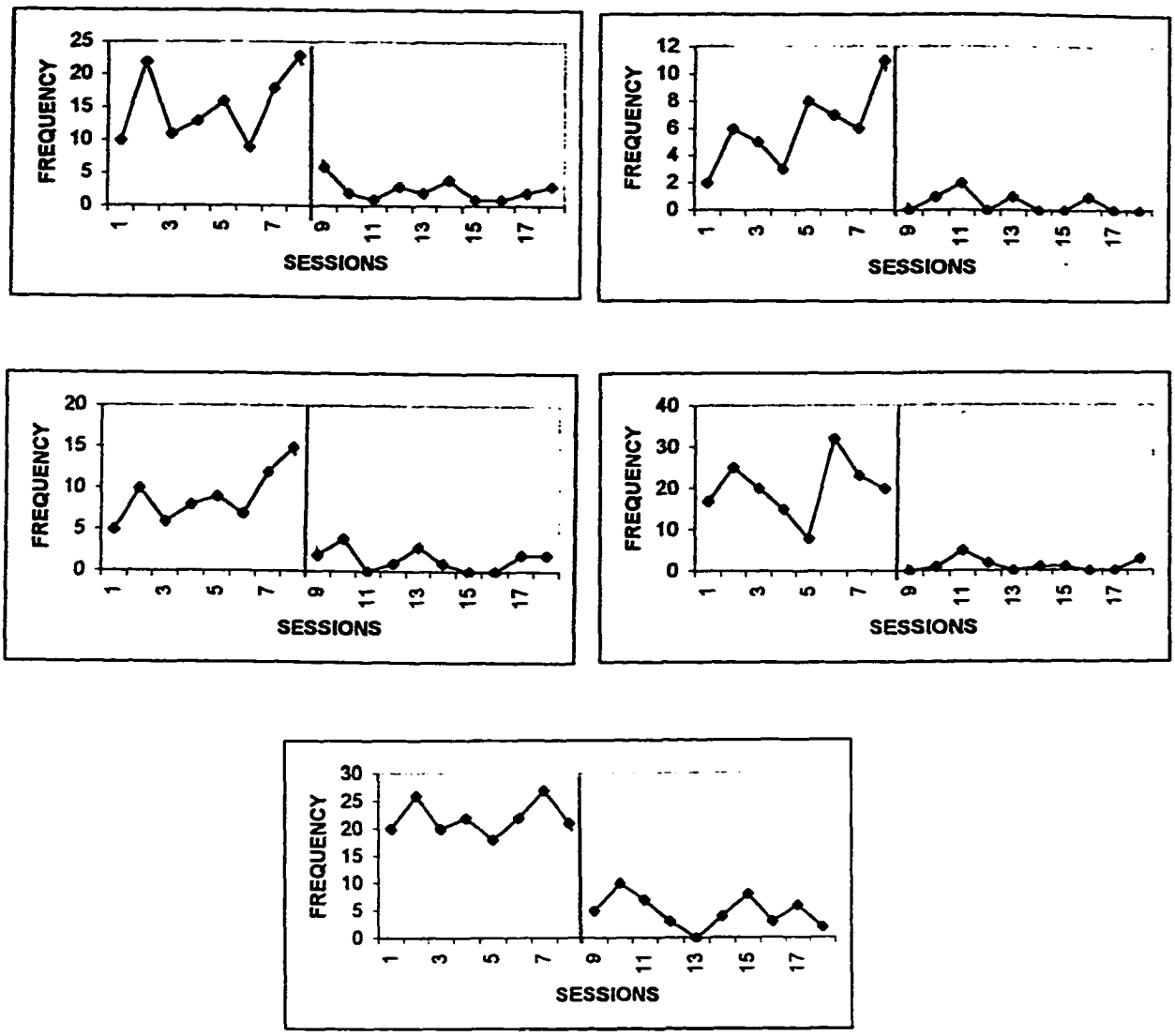

Figure 2. Comparison of Baseline Rate of Stereotypic Movement to Rate During Treatment Session for Placebo Responders.

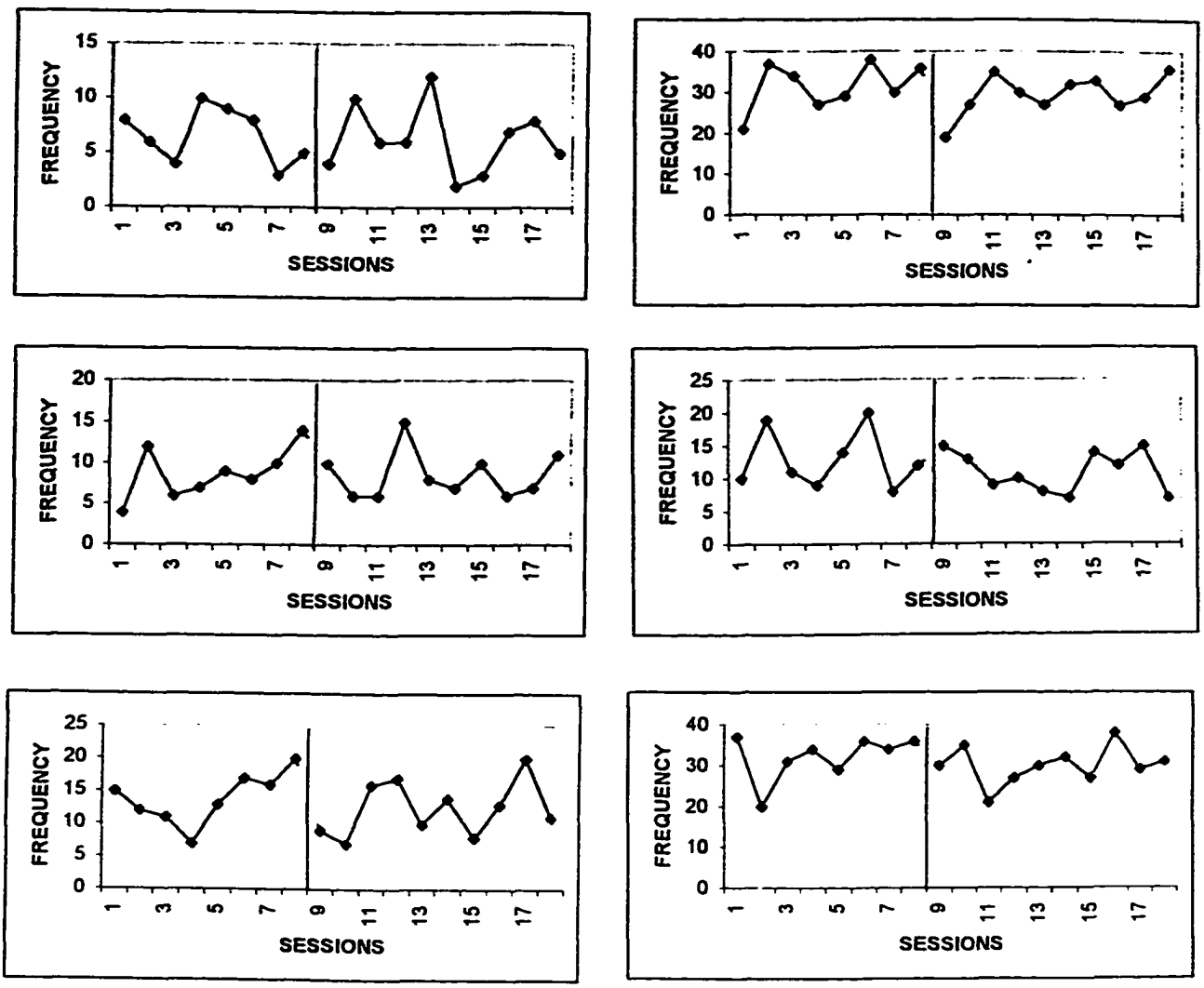

Figure 3. Comparison of Baseline Rate of Stereotypic Movement to Rate During Treatment Session for Placebo Nonresponders.

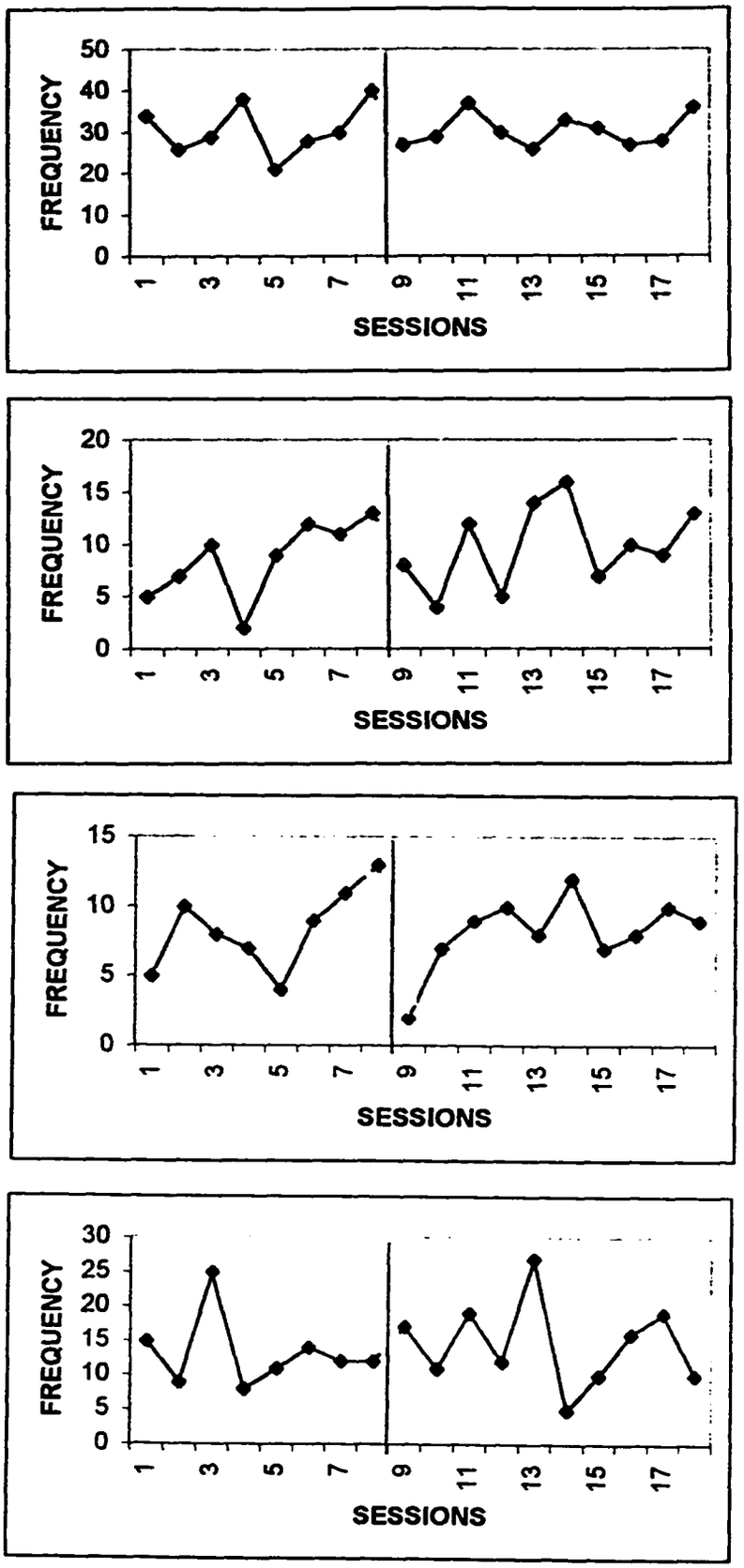

Figure 3 (cont'd).

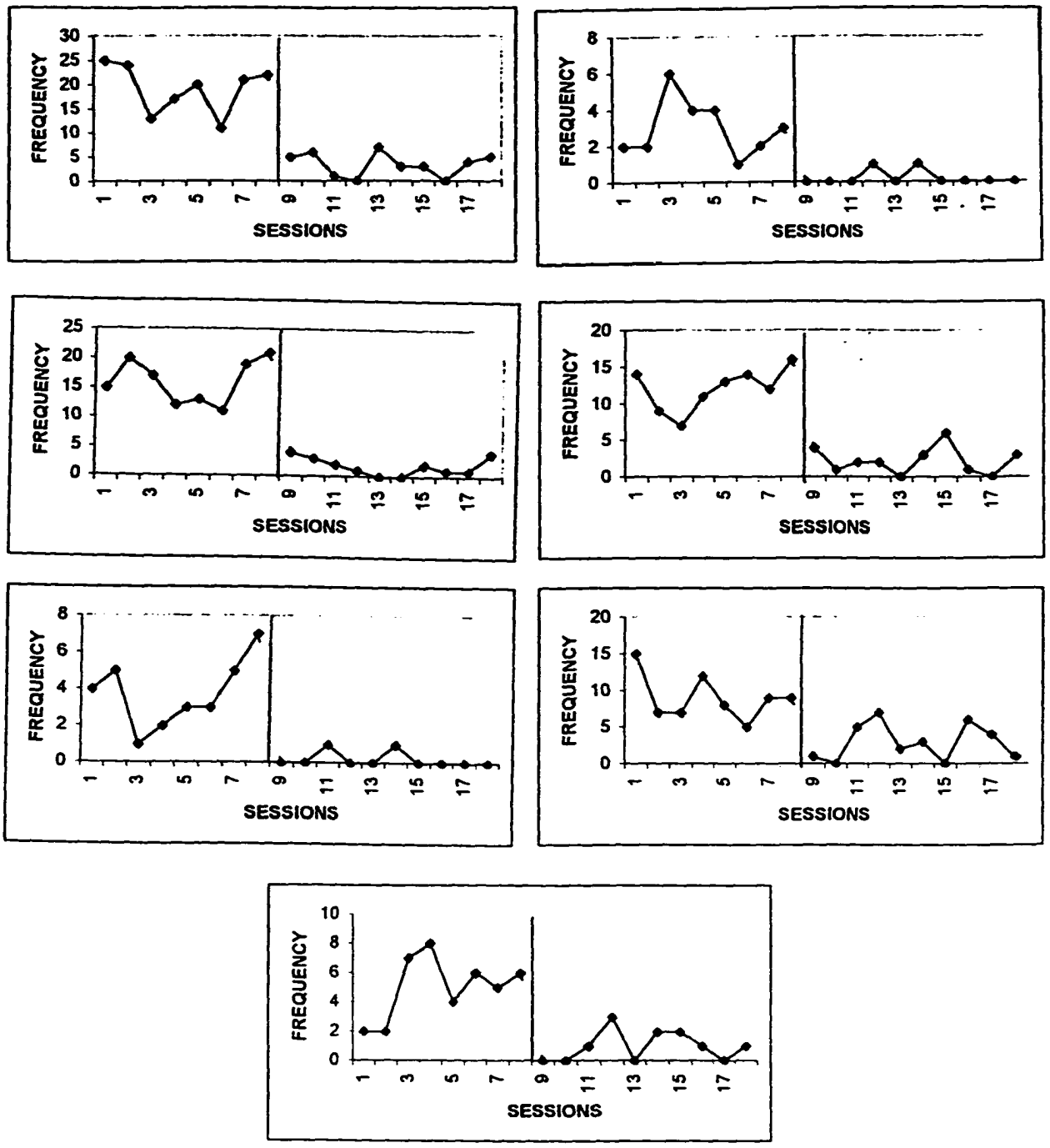

Figure 4. Comparison of Baseline Rate of Stereotypic Movement to Rate During Treatment Session for Experimental Responders.

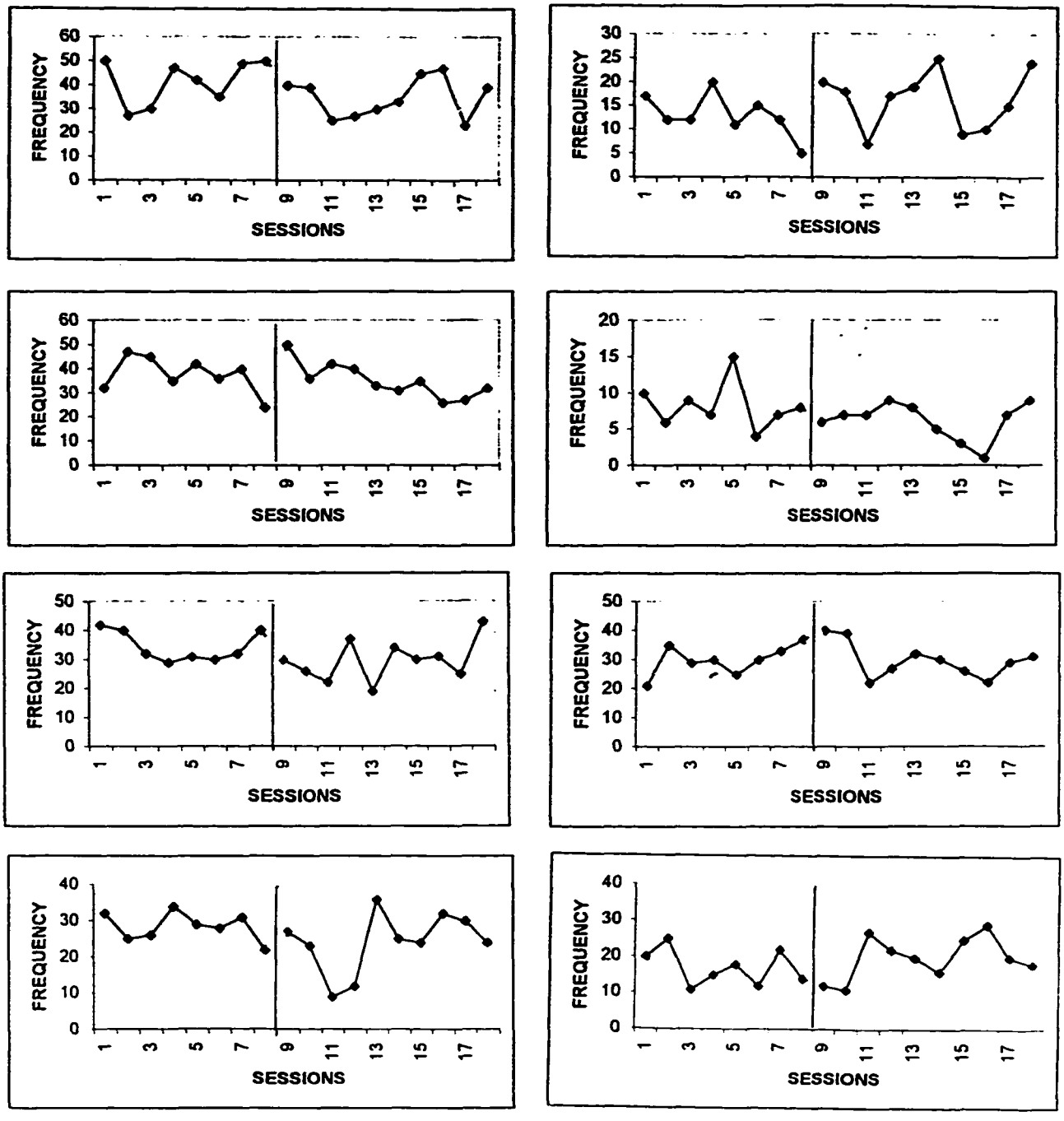

Figure 5. Comparison of Baseline Rate of Stereotypic Movement to Rate During Treatment Session for Experimental Nonresponders.

Reliability and treatment integrity were evaluated to ensure that results were minimally influenced by deviations in observational methods and treatment implementation. Percent agreement was used to calculate interrater reliability for 20% of the sessions. Results yielded a reliability estimate of 91%. Treatment integrity checklists were used to examine consistency of treatment across trainers. Treatment was implemented accurately 98% of the time. Deviations tended to involve presentation of an additional verbal prompt during Snoezelen sessions or lack of needed verbal prompt during placebo sessions.

Discussion

Effects of a sensory enriched environment on the rate of stereotypic movements exhibited by individuals with profound mental retardation were investigated. Effects were examined immediately following exposure to sensory equipment. There was not a significant decrease in stereotypic movements following exposure to the sensory room. Anecdotal reports and examination of data did support a decrease in rates of stereotypic movements for some clients during exposure to the sensory equipment and the placebo-control condition. These decreases were maintained for 2-3 minutes after cessation of exposure to sensory equipment for the snoezelen group which may explain the slight decrease in average rate of stereotypic movements for this group at post-test.

Based on the above information, it would appear that exposure to the sensory room may be somewhat beneficial for some of the clients. For some individuals, it provided at least a short time during which the client was attending to external stimuli and engaging in a decreased number of stereotypic movements. However, this decrease did not occur for the group as a whole and did not last much past cessation of the session. These effects are interesting when compared to the placebo-condition, which is analogous to the normally used enriched environment.

The placebo-control condition also reduced stereotypic behaviors for some individuals during the treatment session. However, no lingering effects were noted and average scores at post-test were the same as those at pre-test.

There are several explanations for why the results may have differed from what was expected. First, topography of the stereotypic behavior may have impacted the results. As mentioned previously, stereotypic movements may occur in various forms (Berkson, 1967; Lovaas, et al, 1987; Schroeder, 1970; Schroeder, 1991). Body rocking is one of the most frequently observed topographies (LaGrow & Repp, 1984). One of the most common forms of stereotypic movements among the participants was body rocking. This form of stereotypic movement is vestibular in nature, the one form of stimulation that is not provided in the current Snoezelen set up. One participant had two stereotypic behaviors, hand mouthing and body rocking. When separated, the hand mouthing occurred less often immediately following exposure, while the body rocking did not. A second individual engaged in body rocking and hand flapping. While in the Snoezelen room, hand flapping was observed only rarely. Body rocking occurred almost continuously during the session. However, once the equipment was turned off, he generally switched to

hand flapping and body rocking was not evident. Lovaas, Newsom, and Hickman (1987) make mention in their theory of the emergence of stereotyped behavior, that these behaviors may be "modifiable by altering sensory and perceptual consequences specific to the particular stereotyped behavior." Thus, it may be that in an environmental enrichment approach attention should be paid to topography of the behavior and environmental manipulations that may be directly linked to the topography.

Second, it is possible that the stimulation provided during exposure is beneficial, but simply not lasting. Thus, some participants may derive some benefit from being exposed to stimuli that decreases rate of stereotypic movements during exposure, but would require multiple types of activities presented throughout the day. Such high intensity exposure to various activities may be expected given the high rate of stereotypic behaviors rated as reinforcing in their own right and thus more difficult to compete with through external stimulation (Lewis & Baumeister, 1982). The sensory room would then be best used as an adjunct to an entire treatment package provided throughout each day. This approach may be necessary given the high rates of stereotypic movements observed in this

population (Berkson & Davenport, 1962; Kaufman & Levitt, 1965; Repp & Barton, 1980; Repp, et al, 1983; Schroeder, 1991).

Third, the use of the sensory room in its current form with all equipment activated does not allow for the possibility of stimulation overload for some individuals. The biological theories cited in the literature review accompanying this project mention the possibility that some stereotypic behaviors occur as a means of reducing overarousal (Guess & Carr, 1991a; Lewis & Baumeister, 1982; Schroeder, 1991). It may be that with fewer, but preferred items activated more individuals may have been better able to focus on those stimuli and derive some benefit from the stimulation.

It is possible that a 10 minute exposure time was simply not sufficient. This time frame was based on information provided in a previous study indicating that 20 minute sessions may have been too long since some individuals became restless during sessions (Ashby et al, 1995). In the present study restlessness was not reported and effects on problem behavior were minimal. However, cessation of stereotypic movements for some individuals did linger for 2-3 minutes following exposure based on review of raw data obtained. It is possible that with a longer exposure time effects may have lasted longer for these individuals.

Further investigations into time components and variations need to be conducted to address this issue.

As this study was an initial investigation into an area that is relatively new, limitations may be cited. First, the study utilized only individuals with profound mental retardation within a residential setting and only those exhibiting a specific type of problematic behavior. While, such specification is useful in studying treatment effects, particularly in the early phases of research, application of results to other groups must await further studies (Hersen & Barlow, 1976; Sidman, 1960).

A second limitation may be that group treatment studies necessitate the systematic replication of the treatment for each individual within the group. Such systematic replication allows for the examination of the treatment effects, while variations in treatment would make this task more difficult (Hersen & Barlow, 1976; Sidman, 1960). However, it does not allow for the individual differences that may be necessary in actual clinical application of treatment to achieve efficacious results.

Based on the discussions surrounding the results and the limitations of the present study, it is apparent that many additional studies should and can be conducted. First, it would be interesting to note the findings if additions were made to the Snoezelen room such as objects

stimulation. Effects with all equipment activated, as well as those with only equipment directly stimulating the same sense as the presenting stereotypic movements, could be investigated and compared. Such studies would address the issue multisensory stimulation versus stimulation of senses preferred in stereotypic movements, two issues addressed in the treatment literature (Lovaas et al, 1987; Mason & Iwata, 1995).

Second, the effects of the sensory room on rate of stereotypies if the participant is immediately engaged in another task or activity should be examined. Two particular variations on this theme might include the following: a) moving immediately into a training task and looking at both effect on rate of stereoptypic movements and effects on concentration and on task behavior; and b) combining the snoezelen room with other environmental enrichment activities and utilizing some treatment package wherein the participant is exposed to various stimulatory activities throughout the day. Researchers have successfully documented changes in rate of stereotypic movements using constant environmental changes (ie., restructuring the day for the individual to include access to alternative activities) (Berkson & Mason, 1963; Guess & Rutherford, 1967; Horner,

providing vestibular stimulation. Effects with all equipment activated, as well as those with only equipment directly stimulating the same sense as the presenting stereotypic movements, could be investigated and compared. Such studies would address the issue multisensory stimulation versus stimulation of senses preferred in stereotypic movements, two issues addressed in the treatment literature (Lovaas et al, 1987; Mason & Iwata, 1995).

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1980). Increases in concentration and on task behavior have also been observed in some groups (Ashby et al, 1995).

Additionally, studies examining the effects of treatment aimed at individualizing use of the sensory room would be beneficial. These studies might address the idea of applying the general protocol of the Snoezelen room but tailoring it to individual needs by assessing preferences prior to implementation of treatment and structuring treatment for each individual around assessment results. Individualized studies may highlight benefits of the sensory equipment that can be obscured in group study results (Hersen & Barlow, 1976). The present study utilized an important method for investigating differences in treatment effectiveness between groups: the group outcome approach. Taken as a whole, the treatment does not appear effective at this time in this setting. The present results may suggest that for the group examined there is a subset of the group that may respond positively to the sensory room. These individuals would be appropriate targets for future research. If responders and nonresponders to exposure to the sensory room were identified, possible benefits could be examined. Thus, an individualized approach at assessing response to treatment would be necessary. Once individualization is utilized and responders are identified, specifics

regarding length of treatment and appropriate use of the sensory equipment can be further examined.

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Appendix A: Informed Consent

PINECREST DEVELOPMENTAL CENTER
INFORMED CONSENT FORM

Project Title: The effects of an enriched environment on the stereotypic movement of individuals with severe and profound mental retardation.

Research Location(s); Pinecrest Developmental Center

Principal Investigators: Brandi B. Smiroldo, MA and Johnny L. Matson, Ph.D.
Phone Number: 318-484-6448 or the PDC psychology officer at 318-641-2258

Description of Research Activities: Forty-five individuals who live at Pinecrest Developmental Center are being asked to participate in a research study. The purpose of the project is to look at the effects of being placed in a room that stimulates the senses (eyes, ears, nose, skin) on the amount of continual movements (such as body rocking) individuals exhibit. These movements may interfere with the individual's response to training tasks. The effects of being in the room will be compared to the effects of no treatment and the effects of being in the room without the equipment being turned on and with the attention of the staff member. If being in the room decreases the number of continual movements more than the other conditions, the results would indicate treatments that my be effective. Also, the effects of being in the room will be looked at right after the treatment and later in the day. This procedure will help to determine if different times of the day may be affected differently. Such results may tell professionals that certain times (such as following treatment) are better used for training tasks. The sensory room will involve items that stimulate visual senses (bubble tubes, slide projector), hearing senses (soft music), touch senses (vibrating materials), and sense of smell (aroma machines).

The participants were selected based on observations by the researchers. The observations were used to determine individuals who engage in continual movements a large amount of the time (50% of observations). They will be randomly assigned to one of three conditions (no treatment, the sensory room without equipment turned on, the sensory room with equipment turned on). Each participant will be observed before treatments are begun for eight sessions. These sessions will be used to determine initial rate of movements. Next, the individuals will be exposed to the condition for ten minutes each day for ten days. They will be observed for ten minutes immediately after the treatment and ten minutes later in the day. These observations will be to note rate of movements at each time following treatment.

Benefits to Subjects: The benefits of participating in this study include the following: a) accurate estimates of time spent engaging in continual movements that may interfere with training/learning; b) aid in determining treatments that may be effective for decreasing such behaviors; and c) aid in determining schedules for training based on how long effects (such as decreases in movements) of treatment last.

Risks to Subjects: Risk associated with study participation is minimal: the only risk is possible increase in continual movements during a session. Data from previous studies suggest that this is unlikely.

Alternatives to Participation in Research: Refusal to participate in the study will not result in any penalty. Individuals declining participation will continue to receive services at the facility as described in his/her individualized program plan. Such services may include access to recreational and training tasks provided by the facility.

Subject Removal Criteria: Since risks are minimal and do not pose any danger to the individual, subjects will be removed only upon the request of their correspondent or if he/she should be physically ill and unable to participate.

Subject's Right to Refuse to Participate or to Withdraw: I understand that participation in this study is voluntary and that I may refuse to participate or withdraw at any time without penalty, especially as concerns my status in or services received from this program, either now or in the future. I will also be informed if the research leads to important things that may change my decision to participate.

Subject's Right to Privacy: I understand that may privacy will protected and that neither may name nor any information identifying me will be used under any circumstances.

Release of Information: I understand that this form does not authorize the release of any identifying information to any party under any circumstance; nor does it authorize the release of information from my case record.

Publication/Distribution of Findings: I understand that the results of this research may be published or otherwise distributed but that results will not contain any identifying information.

Assurances/Signatures: This study has been discussed with me. I have been able to ask questions, and those questions have been answered to my satisfaction. I understand that I can ask other questions of the researcher(s) at any time. I have also been informed that if I have concerns about the rights of human subjects, I can call the division of Research and Development at (504) 342-3819. I agree with the terms of this consent form and have been given a copy.

_____ _____

Signature of Subject Date

_____ _____

Signature of Witness Date

Reader Attests: The subject has informed me that he/she is unable to read. I hereby certify that I have read this consent form to the subject and have explained that by signing above he/she agrees to participate.

_____ _____

Signature of Reader Date

Children and/or Subjects Unable to Give Informed Consent: The subject is _____ a child or person unable to give informed consent, and I certify that I am the subject's legal guardian and do give my consent for his/her participation.

_____ _____

Legal Guardian's Name/Signature Date

_____

Subject's Name and Age

_____ _____

Subject's Signature Date

Appendix B: Data Sheet

STEREOTYPIC BEHAVIORS PER MINUTE

Condition: _____
Time: _____
Date. _____
Participant: _____

minute		total
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Condition: _____
Time: _____
Date: _____
Participant: _____

minute		total
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Vita

Brandi B. Smiroldo is a native of Gonzales, Louisiana. She received her bachelor's degree in psychology from Louisiana State University in 1993, graduating with college honors. She entered the doctoral program in clinical psychology at Louisiana State University in the fall of 1993. She completed the requirements for the master's degree in December of 1995, and is currently a candidate for the degree of doctor of philosophy. Her research and clinical interests include developmental disabilities and dual diagnosis issues.

DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Brandi B. Smiroldo

Major Field: Psychology

Title of Dissertation: The Effects of an Enriched Environment on the Stereotypic Movement of Individuals with Profound Mental Retardation

Approved:

Major Professor and Chairman

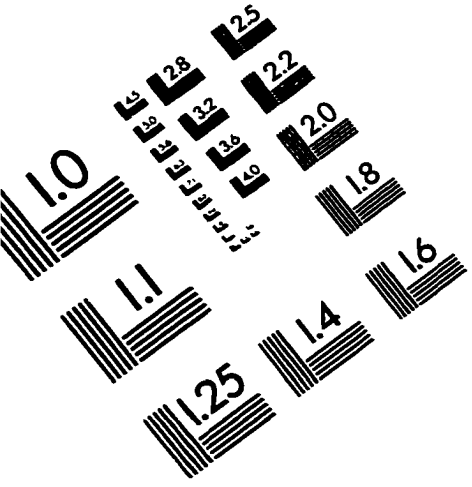
Dean of the Graduate School

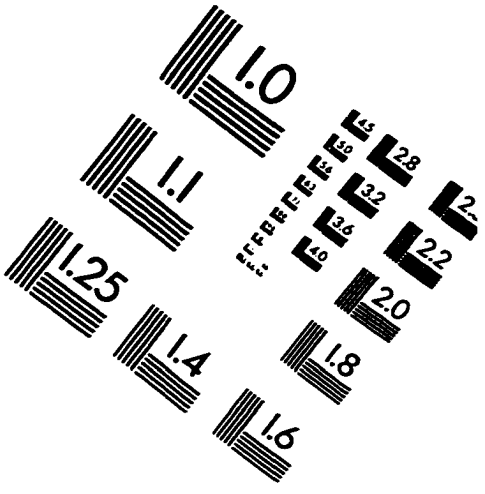
EXAMINING COMMITTEE:

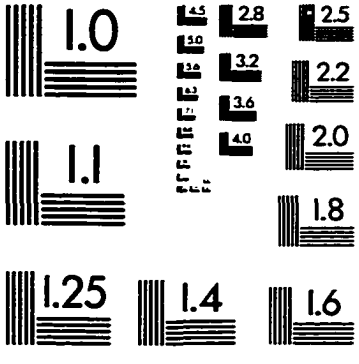
Date of Examination:

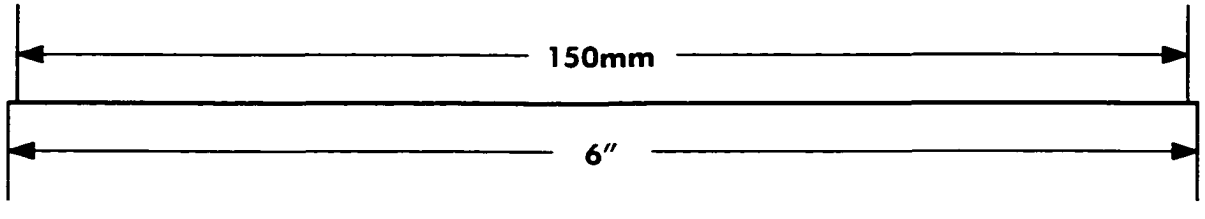
October 5, 1998

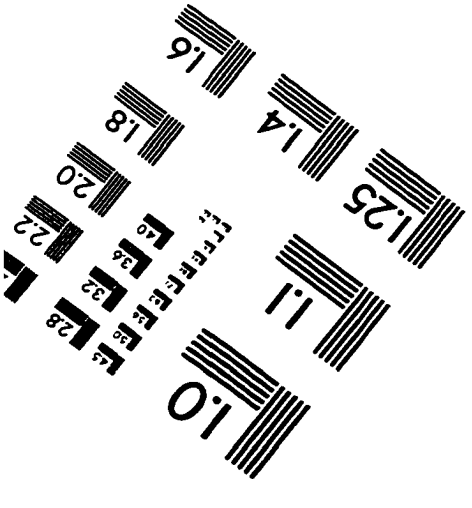
IMAGE EVALUATION
TEST TARGET (QA-3)

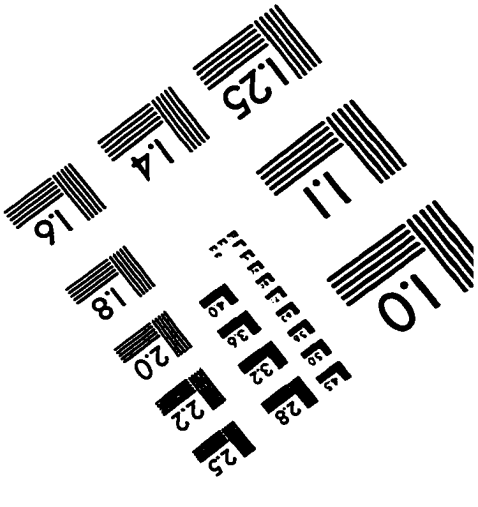












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